

Contract No. F41624-01-D8546
Delivery Order No. 0010

**FINAL
NON-TIME CRITICAL REMOVAL ACTION
WORK PLAN AND FIELD SAMPLING PLAN
IRP SITES 10 AND 12
NORTON AIR FORCE BASE
SAN BERNARDINO, CALIFORNIA**

NOVEMBER 2003

PREPARED FOR:

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AIR FORCE REAL PROPERTY AGENCY
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LIST OF ACRONYMS AND ABBREVIATIONS

AFB	Air Force Base
AFCEE	Air Force Center for Environmental Excellence
AM	Action Memorandum
bgs	below ground surface
CCR	California Code of Regulations
CDFG	California Department of Fish and Game
CDM	Camp, Dresser, and McKee Federal Programs
CFR	Code of Federal Regulations
CoC	chain-of-custody
COPC	contaminant of potential concern
CQP	construction quality plan
cy	cubic yard
DO	delivery order
DQO	data quality objective
DTSC	Department of Toxic Substances Control
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FSP	field sampling plan
HSP	health and safety plan
ID	identification
IRP	Installation Restoration Program
LCS	laboratory control sample
MDL	method detection limit
mg/kg	milligram per kilogram
mg/L	milligram per liter
mm	millimeter
MS/MSD	matrix spike/matrix spike duplicate
NAD83	North American Datum of 1983
ng/kg	nanograms per kilogram
OSHA	Occupational Health and Safety Administration
PAH	polycyclic aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
pg/L	picogram per liter
PPE	personal protective equipment
PRG	preliminary remediation goal
QA	quality assurance
QAP	quality assurance plan
QAPP	quality assurance project plan
QC	quality control
QPP	quality program plan
RA	removal action
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RL	reporting limit
RVR	removal verification report
SAP	sampling and analysis plan

SBIAA	San Bernardino International Airport Authority
SCAQMD	South Coast Air Quality Management District
SOP	standard operating procedure
TCDD	tetrachlorodibenzo-p-dioxin
TEF	toxicity equivalency factor
TEQ	toxicity equivalent
USAF	United States Air Force
USFWS	United States Fish and Wildlife Service
WP	work plan

1.0 INTRODUCTION

This document presents the Work Plan (WP) and Field Sampling Plan (FSP) for the non-time critical removal action (RA) of dioxin/furan-contaminated soil at Installation Restoration Program (IRP) Site 10 and metals-contaminated soil at IRP Site 12 at the former Norton Air Force Base (AFB), San Bernardino, California. The RA is a result of the Action Memorandum (AM) for IRP Sites 10 and 12 (Earth Tech, 2003). This document has been prepared by Earth Tech under the direction of the Air Force Center for Environmental Excellence (AFCEE) under Delivery Order (DO) 0010 as part of Contract F41624-01-D8546, and identifies work to be completed to remove and dispose contaminated soil at IRP Sites 10 and 12, the sampling and analysis plan for confirmation sampling and any remaining characterization, and post-removal site restoration activities. Earth Tech will implement this WP and FSP for IRP Sites 10 and 12 under the separate DO 0025 as part of Contract F41624-01-D8546.

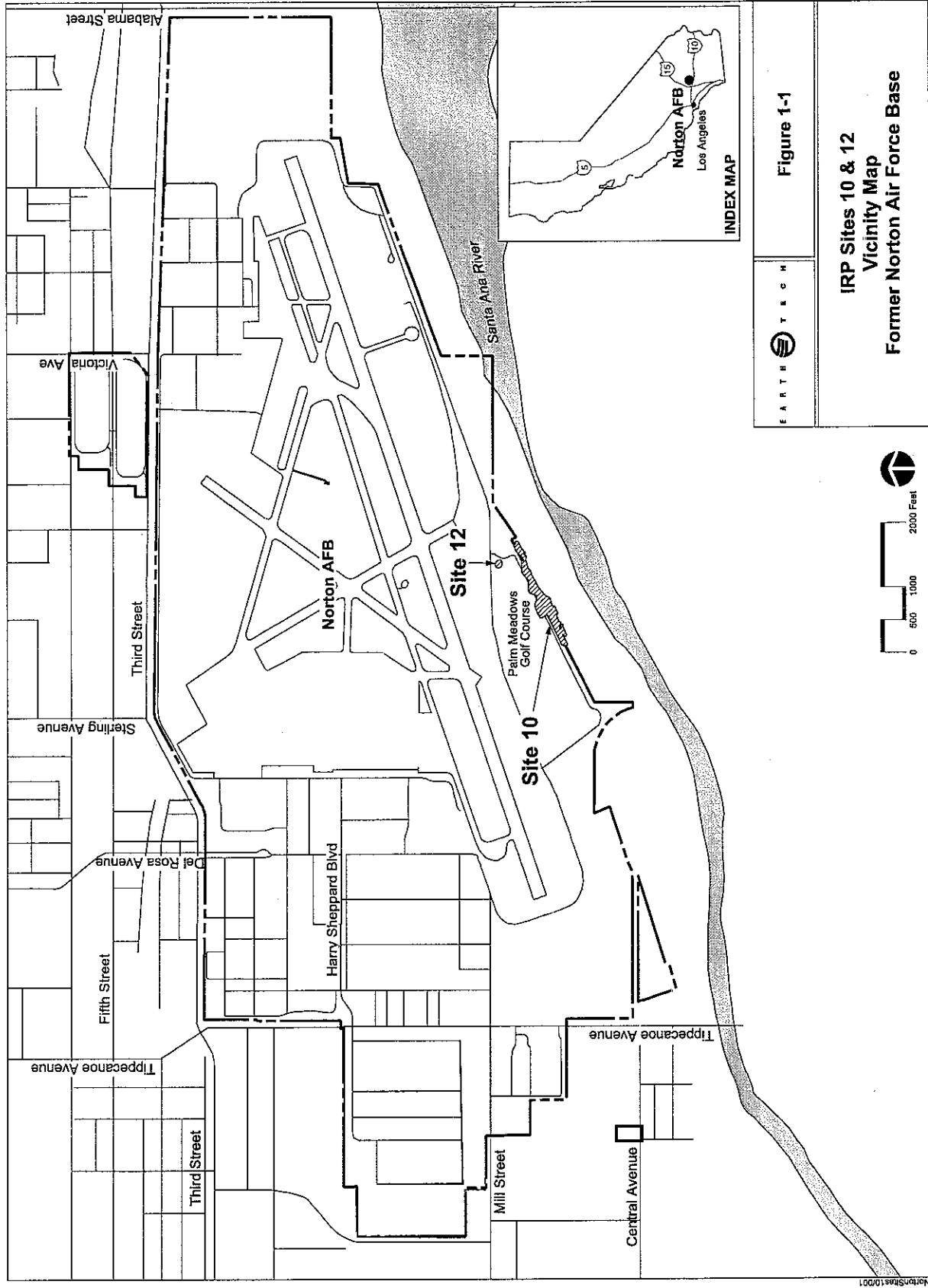
To implement the RA and other activities as described in the scope of work, Earth Tech will provide personnel and equipment, coordination, management, and supervision. Earth Tech will support the Air Force in consultation with state and federal agencies concerning potential impacts of the RA on identified endangered species. Earth Tech will also oversee compliance with contract and regulatory requirements, and provide detailed documentation to AFCEE and the appropriate regulatory agencies for all aspects of the project. Following removal and restoration activities, a written report will document all activities, and present details of the final site conditions.

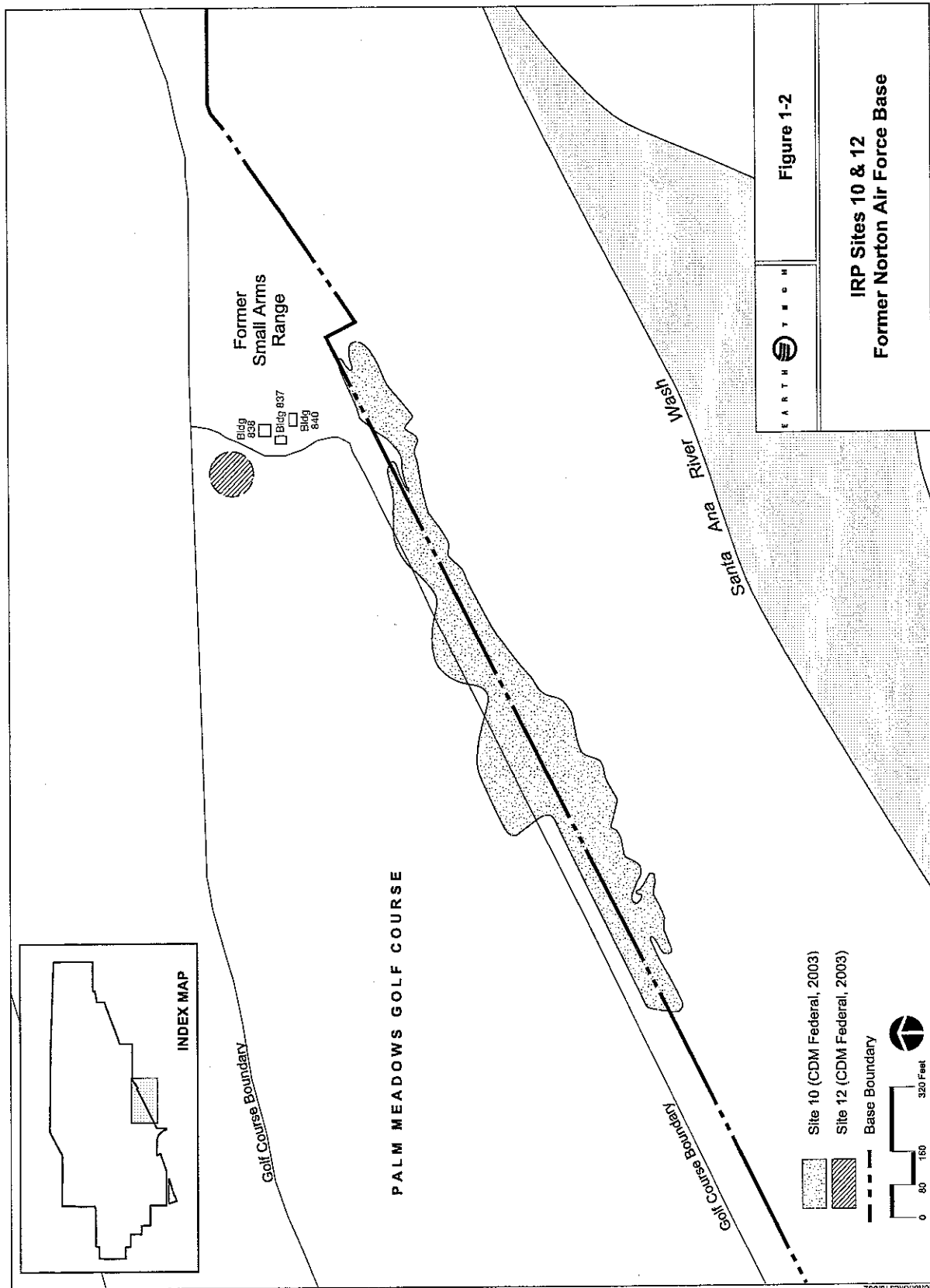
1.1 SITE LOCATION AND DESCRIPTION

The former Norton AFB is situated in the city of San Bernardino, California, approximately 60 miles east of Los Angeles. The base is bordered to the south by the Santa Ana River wash area, and by light industrial and residential areas to the north, east, and west. Other cities near the base include Redlands, Loma Linda, Riverside, and Colton (Figure 1-1). Total coverage of the base consists of approximately 2,100 acres. The base was commissioned in 1942 during World War II to provide aircraft maintenance support and was formally closed in 1994.

Sites 10 and 12 are situated in the south-central portion of the base in and adjacent to an area that was developed into the Palms Meadows golf course (Figure 1-2). Prior to construction of the golf course Site 10 was used as a landfill and Site 12 was used as a waste pit. The Site 10 landfill was operated by the Air Force from 1943 to 1958 and was used for disposal of general refuse, including many of the trees removed during the construction of the adjacent Palm Meadows golf course. At least some of the waste was burned at the site during the operational period. Currently the remaining waste consists of concrete rubble, asphalt, construction wastes, and materials such as roofing tar paper. Evidence of burning is found in localized areas of ash and in thin, ash layers over the western half of the site (CDM Federal, 2000a).

To the northeast, Site 12 is situated adjacent to Site 10 and on the eastern edge of what is now the Palm Meadows golf course (Figure 1-2). The site has been identified as a waste pit containing chemical and construction debris wastes, with reported incineration of the wastes within the pit itself (CDM Federal, 2003). It is thought that use of the pit occurred prior to 1959 and before the construction of the golf course. Ash material has been observed in the vicinity of the suspected waste pit and potentially indicates the burning of waste contained within the pit. A geophysical investigation as well as soil borings/sampling have not located waste pit material within the suspected area.





1.2 BACKGROUND

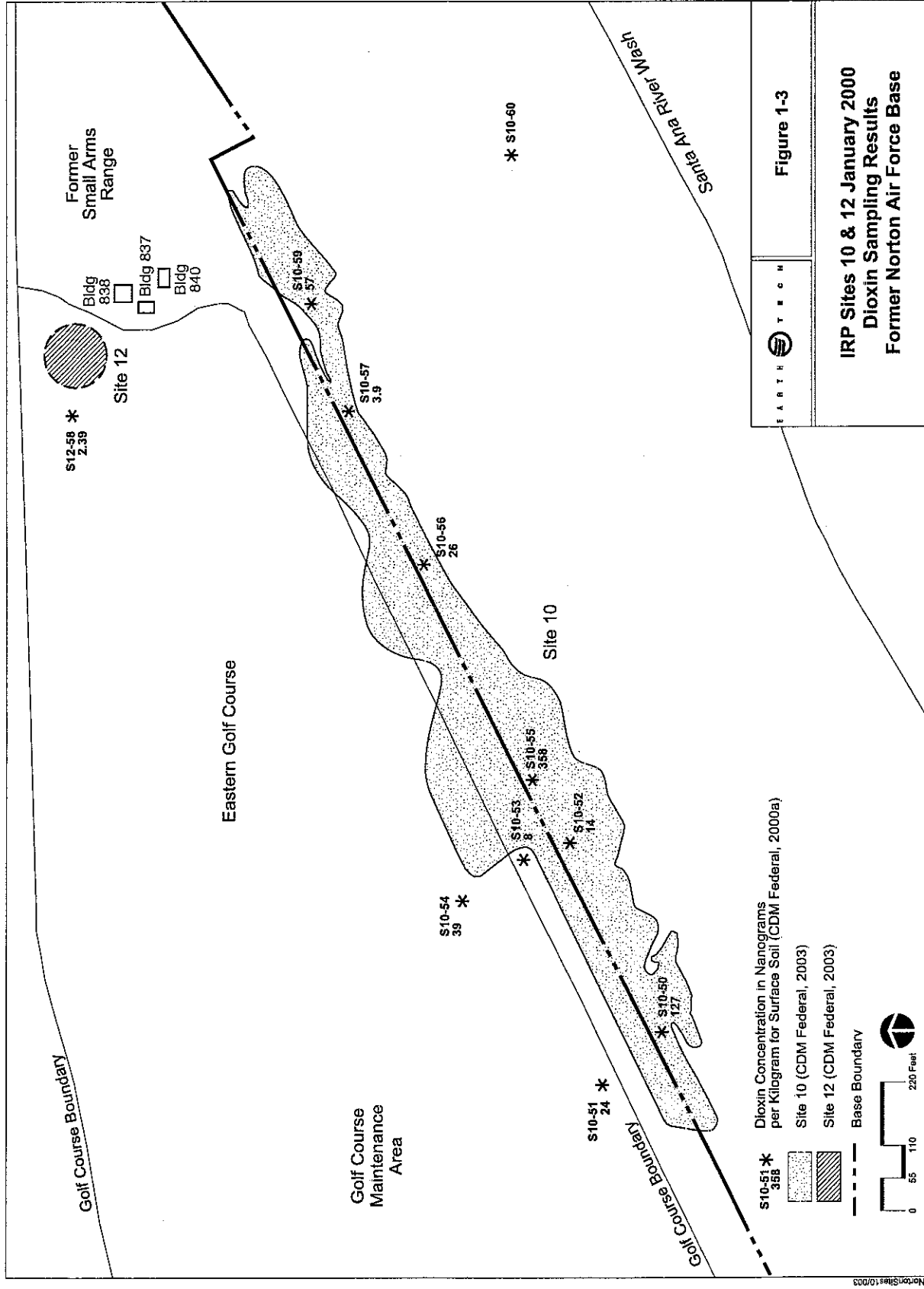
Since 1985, several investigations have been conducted across Sites 10 and 12, and include the 1985 IRP (Ecology and Environment, 1987); the Basewide Remedial Investigation (RI) (CDM Federal, 1993); Sites 2 and 10 Landfill Investigations (CDM Federal, 1994); the Expanded Source Investigation (CDM Federal, 1996); and, more recently, an investigation of dioxins/furans, polychlorinated biphenyls (PCBs), chlorinated pesticides, and metals (CDM Federal, 2000a).

During the earlier site investigations, the metals lead, cadmium, chromium, arsenic, nickel, and zinc were detected above background levels at Sites 10 and 12, particularly in near surface (less than 1 foot below ground surface [bgs]) ash layers left over from waste incineration. Subsequent risk analysis indicated that the metals at Site 10, particularly lead, presented an ecological risk. It was thus determined that a "hot-spot" soil removal action was warranted at Site 10 to reduce the metals contamination (CDM Federal, 1998). Subsequently, a "hot-spot" removal action for metals was conducted in order to reduce risks to both human health and ecological receptors (Bechtel Environmental, 1998). Confirmation samples from the site indicated that metals concentrations were significantly reduced and that no further action for Sites 10 and 12 was necessary (United States Air Force [USAF], 1999). However, the California Department of Toxic Substances Control (DTSC) indicated that a data gap existed for dioxins/furans and polycyclic aromatic hydrocarbons (PAHs) at Sites 10 and 12. This was based upon the fact that dioxins/furans and PAHs can potentially be produced as a byproduct of the burning of wastes. Although some dioxin/furans analyses were conducted in the past, detection levels were too high for comparison of the data to the current preliminary remediation goals (PRG). PAH data was also previously collected; however, samples were not collected from ash or burned material.

To meet the data gaps, additional characterization was conducted for dioxins/furans and PAHs at Sites 10 and 12 during January 2000 (CDM Federal, 2000a). A total of 11 soil samples were collected in and adjacent to Site 10, with 1 sample collected from Site 12 and 1 background sample collected from the Santa Ana river wash area (Figure 1-3). Detected PAH concentrations did not exceed residential PRGs in any of these samples. However, dioxin/furan contamination was present in all of the samples collected with concentrations ranging from 0.87 nanogram per kilogram (ng/kg) for the background sample S10-60, to 358 ng/kg for the sample S10-55 located near the middle of Site 10. Sample S10-55 was reported to be associated with the ash material (CDM Federal, 2000a).

At Site 12 only two samples showed dioxin/furan levels above the established cleanup goal, and based on the risk assessment, dioxins/furans were not considered an issue at Site 12.

In response to these findings, DTSC requested that additional soil characterization be conducted at the sites in order to define the lateral and vertical extent of dioxin/furans contamination, and to determine the need and scope for a potential soil RA. Also, the Air Force agreed to collect new analytical data for PCBs, pesticides, and metals, particularly in areas where ash has been observed (CDM Federal, 2000a). Samples were collected from 55 locations in and adjacent to Sites 10 and 12 during August/September 2000. For dioxin/furan analyses, the depth intervals of surface, 2 feet bgs, and 4 feet bgs were targeted for collection of soil samples. For PCBs, pesticides, and metals, samples were collected based on the presence of ash or waste, and not all sampling locations and depths were sampled for PCBs, pesticides, and metals. A total of four locations were placed in the Santa Ana River bed, with two of the locations designated as upgradient background locations, and the other two designated as downgradient background locations.



The results of this sampling effort indicated that metals are not above background range except for five locations contained within the ash layers at Site 10. At Site 12 this sampling effort indicated no locations with metals above background concentrations. This residual metals contamination appears to be correlated with the areas of dioxin/furan contamination, and would likely be eliminated during any dioxin/furan removal action. PCBs and pesticides were not found to be of concern (CDM Federal, 2000b). Dioxin/furan contamination was characterized both horizontally and vertically to a depth of 4 feet bgs, with one sample collected within an ash layer at the surface having a dioxin/furan concentration of 358 ng/kg. Also, elevated dioxin/furan concentrations were found vertically within the upper two feet of soil, with concentrations decreasing rapidly between 2 and 4 feet bgs. Of the samples collected from 2 feet bgs, one contained a maximum dioxin/furan concentration of 190 ng/kg, while of the samples collected from 4 feet bgs, one contained a maximum dioxin/furan concentration of 10.9 ng/kg. Figure 1-4 illustrates the lateral distribution of dioxin/furan concentrations in surface soil, as interpreted from the analytical data collected during January and September 2000.

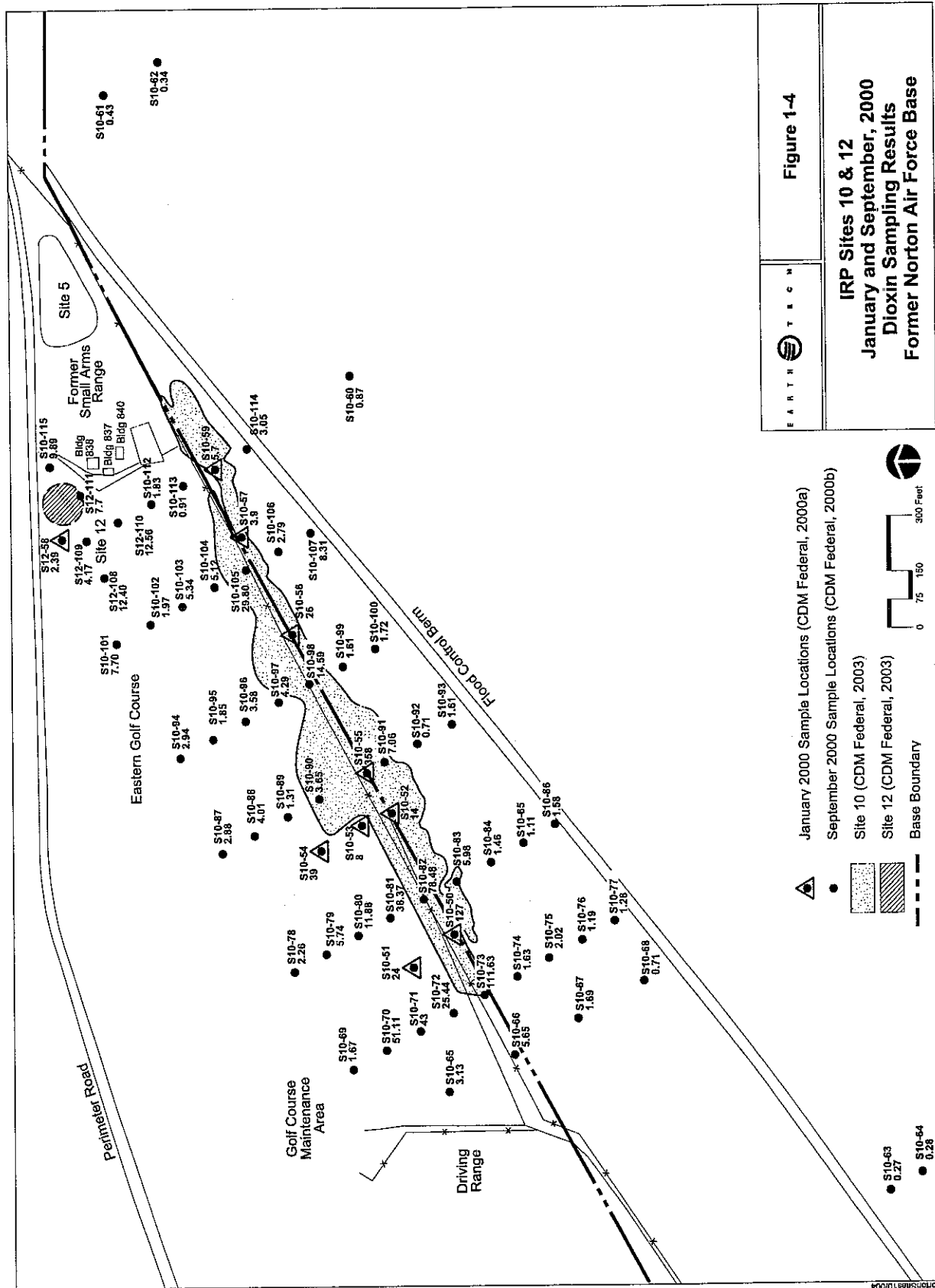
At Site 12, the metals arsenic, lead, cadmium, and nickel were detected during the Basewide Confirmation Study (CDM Federal, 1995b). At one boring, SS-5 (Figure 1-5), soil collected from 5 feet bgs contained lead at 2,050 milligrams per kilogram (mg/kg), cadmium at 416 mg/kg, nickel at 167 mg/kg, and arsenic at 5.1 mg/kg. At boring SS-7, lead and cadmium were found in a sample collected from 5 feet bgs at 845 mg/kg and 37.5 mg/kg, respectively, and arsenic was found at 2.7 mg/kg. All of these concentrations exceeded the residential PRGs, and in the case of arsenic, the established background level. Dioxins/furans were also detected at Site 12, however, only two of the sampling locations had concentrations in the surface soil that exceed the cleanup goal. At S12-108, dioxin/furan was found at a concentration of 12.4 ng/kg, and at S12-110, dioxin/furan was detected at a concentration of 12.56 ng/kg. Both concentrations slightly exceed the 10 ng/kg cleanup goal. However, risk analysis indicates that dioxin/furan at Site 12 does not present unacceptable risk (CDM Federal, 2003).

1.3 OBJECTIVES AND PROPOSED CLEANUP LEVELS

The objectives of the proposed work are to remove dioxin/furan contaminated soil at Site 10 and metals contaminated soil at Site 12 at concentrations that pose risks to human health and the environment, properly transport the soil to an approved disposal facility, replace removed soil with clean backfill material, and restore the sites to their original condition as nearly as possible.

Based upon the findings presented in the Basewide Feasibility Study (CDM Federal, 2003) and per agreement with the regulatory agencies, the cleanup criteria for dioxins/furans at Site 10 has been established as 10 ng/kg total 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalent level or concentration. The cleanup value is calculated by multiplying each of the dioxin/furan isomers by its appropriate toxicity equivalency factor (TEF), and summing the resultant toxicity equivalent (TEQ) values to yield the total 2,3,7,8-TCDD equivalent concentration. Table 1-1 lists the TEFs for each of the dioxin/furan isomers.

The metal contamination at Site 12 is considered a "hot spot" removal with cleanup to consist of removal of the two areas containing elevated metals to levels at or below residential PRGs, or for arsenic, at or below the previously established background concentration. Table 1-2 lists the cleanup goals that will be utilized for metals and as established in the basewide feasibility study (CDM Federal, 2003).



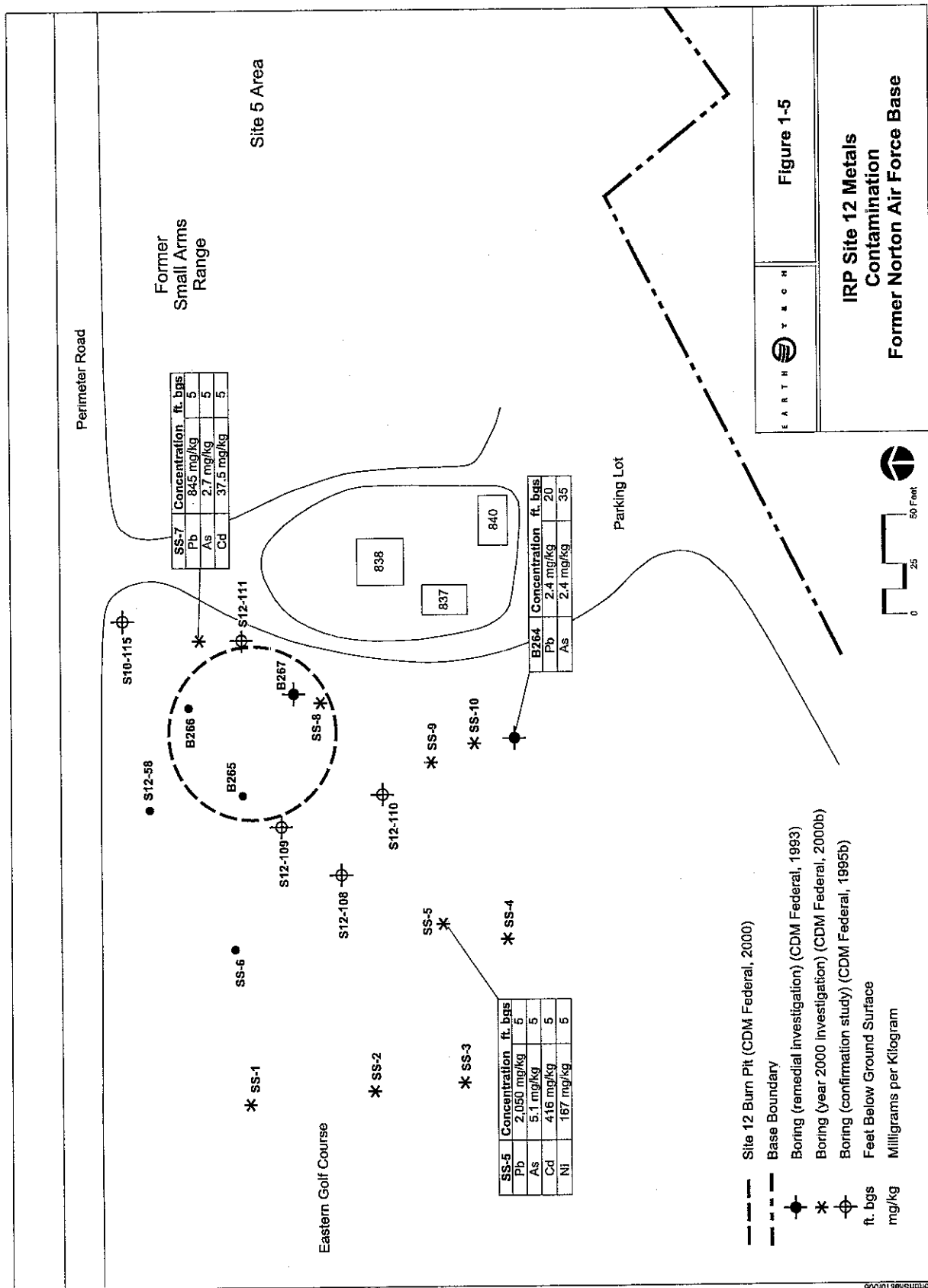


Table 1-1. Dioxin/Furan Isomer Toxicity Equivalency Factors

Analyte (ng/kg)	Toxicity Equivalency Factor
2,3,7,8-tetrachlorodibenzo-p-dioxin	1.0
1,2,3,7,8-pentachlorodibenzo-p-dioxin	1.0
1,2,3,4,7,8-hexachlorodibenzo-p-dioxin	0.1
1,2,3,6,7,8-hexachlorodibenzo-p-dioxin	0.1
1,2,3,7,8,9-hexachlorodibenzo-p-dioxin	0.1
1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin	0.01
octachlorodibenzo-p-dioxin	0.0001
2,3,7,8-tetrachlorodibenzofuran	0.1
1,2,3,7,8-pentachlorodibenzofuran	0.05
2,3,4,7,8-pentachlorodibenzofuran	0.5
1,2,3,4,7,8-hexachlorodibenzofuran	0.1
1,2,3,6,7,8-hexachlorodibenzofuran	0.1
2,3,4,6,7,8-hexachlorodibenzofuran	0.1
1,2,3,7,8,9-hexachlorodibenzofuran	0.1
1,2,3,4,6,7,8-heptachlorodibenzofuran	0.01
1,2,3,4,7,8,9-heptachlorodibenzofuran	0.01
octachlorodibenzofuran	0.0001

ng/kg = nanogram per kilogram

Table 1-2. Clean Up Goals for Metals at Sites 10 and 12

Metal	PRG or Background (mg/kg)
Antimony	31.0
Arsenic	1.5*
Beryllium	0.7
Cadmium	9.0
Chromium	150
Copper	2,800
Lead	160
Mercury	23
Nickel	150
Selenium	380
Silver	380
Thallium	6.1
Zinc	23,000

Note: * established background concentration
mg/kg = milligram per kilogram
PRG = preliminary remediation goal

1.4 PROJECT ORGANIZATION AND SCHEDULE

1.4.1 Project Personnel

The project team has been selected to provide the specific technical and managerial capabilities and qualifications to successfully perform the activities described throughout this workplan. Many of these personnel have specific, previous project experience on similar projects. The project organization will ensure that all project objectives will be met in a timely, cost-effective manner. Figure 1-6 displays a chart of personnel responsible for various tasks necessary to complete the planned work. The following is a list of key personnel, their project titles, and phone numbers:

1	Program Manager	-	Phillip Watts	303-694-6660
2	Project Manager	-	Alain Sharp	909-554-5053
3	Task Manager	-	Thomas Funk	909-554-5027
4	Project Health and Safety Manager	-	Bob Poll	562-951-2242
5	Project Quality Assurance Manager	-	Elisabeth Fruth	562-951-2241
6	STL Sacramento Laboratory Project Manager	-	Bonnie McNeill	916-373-5600

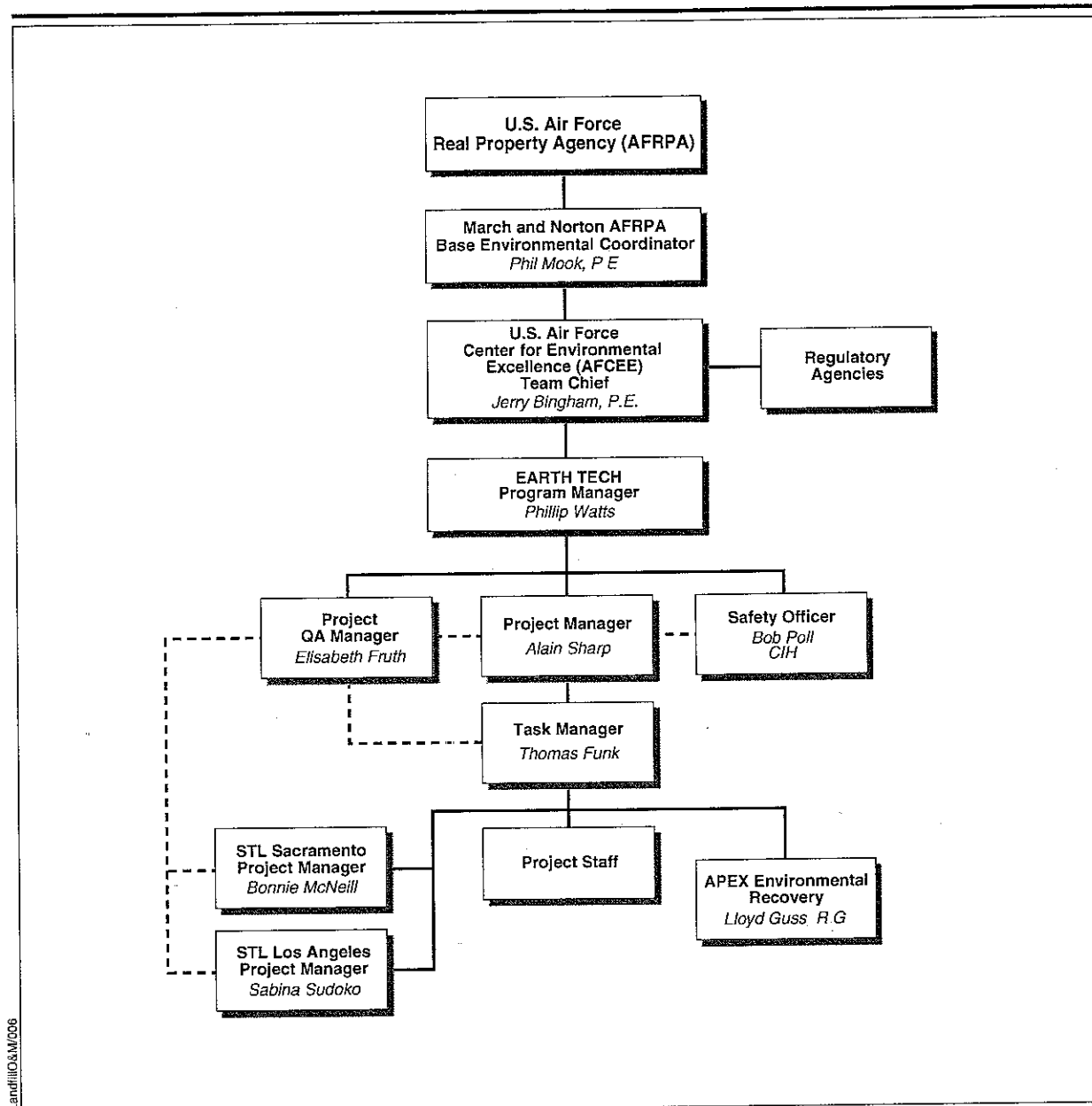
1.4.2 Project Schedule

The project schedule is divided into three phases as shown in Figure 1-7. The first phase or pre-removal portion, consists of preparation of the AM and this WP, as well as any environmental assessments or consultations with regulatory agencies. In addition, all necessary permits and approvals will be obtained for ingress and egress to properties affected that lie outside the former base boundary. This phase is expected to be performed from August 2003 through October 2003.

The second phase in the schedule will consist of the actual field activity portion of the project. Mobilization of equipment, soil removal, backfilling, site restoration, and other field work will be completed in a timely manner. Work is expected to last approximately 8 weeks and is scheduled to occur from November 2003 through December 2003.

The final phase of the work will consist of preparation of final reports and associated maps. This work is anticipated to last approximately 2 weeks and will occur from January 2004 through March 2004.

During the second phase of the planned work, it will be critical to adjust work on the golf course portion such that the golf course area is given priority to minimize the overall impact of the removal action. At least three of the playing holes on the course will be affected during the planned field work. Earth Tech will attempt to schedule work in such a way that work will begin on the golf course area and proceed as quickly as possible. Removal of soil, confirmation sampling, backfilling, and restoration/landscaping will occur on the golf course area first, then progress to the area outside of the former base boundary.



Earth Tech
Quality Assurance
Project Organization
Removal Action
Sites 10 and 12
Norton Air Force Base

Figure 1-6

ID	Task Name	Duration
1	Original Notice to Proceed	0 days
2	USFWS Coordination	140 days
3	Draft Action Memo to Regulators	0 days
4	Final Action Memo issued to AF	0 days
5	Preliminary Draft Work Plan issued to AF	0 days
6	Draft Work Plan issued to Regulators	0 days
7	Draft Final Work Plan Issued to AF	0 days
8	AF review of Draft Final Work	7 days
9	Incorporate AF Comments to Draft Final WP	1 day
10	Final WP for regulators review	30 edays
11	Remedial Action Operation	70 days
12	Soil Removal and Disposal	8 wks
13	Confirmation Sampling and Analysis	3 wks
14	Golf Course Restoration and Off-Base Restoration	3 wks
15	Reporting	160 days
16	Prepare Draft Closure Report	69 days
24	Issue Draft RV/Closure Report to Regulators	0 days
25	Prepare Draft Final Closure Report	69 days
31	Issue Draft Final RV/Closure Report to Regulators	22 days
32	Regulatory Review of Draft Final RV/Closure Report	30 edays
33	Issue Final RV/Closure Report for Regulatory Re	0 days

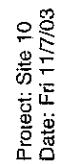


Figure t-7

2.0 SCOPE OF WORK

The scope of work planned for Sites 10 and 12 includes excavating dioxin and metals contaminated soil, transporting the soil to an approved disposal facility, and restoring the sites as nearly as possible to original condition. The scope of work includes performing and implementing the following activities:

- Plan and coordinate prefield activities and obtain necessary digging permits
- Conduct a pre-removal survey of conditions in the environmentally sensitive areas, including the condition of endangered species
- Perform a topographical survey to document pre-removal site conditions and to establish survey control points
- Define and mark removal boundaries
- Clear excavation areas for underground utilities by calling Dig Alert and using geophysical methods
- Mobilize subcontractor to site
- Install security fencing around work areas
- Install temporary erosion control, where necessary
- Clear brush and vegetation in the environmentally sensitive removal area (south of the former base boundary) and retain for use during restoration
- Excavate, load, and transport other solid waste debris (primarily waste concrete and asphalt) to an approved recycling or disposal facility
- Excavate, load, and transport dioxin-contaminated soil to approved disposal facility
- Conduct post-removal confirmation soil sampling
- Survey final limits of excavation and final soil sampling locations
- Transport and compact clean backfill material to sites and backfill excavation
- Reconstruct topographic surface conditions according to pre-removal topographic survey
- Install affected portions of the golf course irrigation system and restore and landscape fairways, tee boxes, and other affected areas of the golf course
- Distribute previously removed vegetation material across the environmentally sensitive area south of the former base boundary
- Remove all temporary structures and materials
- Demobilize equipment and remove all project-related supplies and debris
- Prepare a remediation verification report (RVR).

2.1 PREFIELD ACTIVITIES

Prior to the start of field work, activities will be performed to ensure fieldwork progresses smoothly with minimal interruptions. These activities will include the submittal of a Quality Program Plan (QPP), a WP, a Sampling and Analysis Plan (SAP), a contractor Health and Safety Plan (HSP), and Construction Quality Plan (CQP). In addition, Earth Tech will coordinate all utility clearances where necessary, and will assist contractors in obtaining all necessary digging permits from the appropriate authorities in coordination with the San Bernardino International Airport Authority (SBIAA). In addition, Underground Service Alert or Dig Alert will be notified with a request for clearance of the affected areas.

Prior to mobilization, a meeting will be held at the site with the subcontractor and other appropriate personnel. This meeting will be used to discuss and develop an understanding of the HSP and its administration, the project execution, site-specific protocols, work areas, traffic controls, and other areas of potential concern.

2.2 PRE-REMOVAL ENVIRONMENTAL SURVEY

Sensitive habitats have been mapped for the sites. The listed animal species found in and around the proposed removal area is the San Bernardino kangaroo rat (*Dipodomys merriami parvus*). The listed plant species found in and around the proposed removal area is the Santa Ana River woolly-star (*Eriastrum densifolium sanctorum*), a plant endemic to the San Bernardino area and inhabiting the floodplain of the Santa Ana River. A live-trapping survey for the San Bernardino kangaroo rat was conducted in and adjacent to the RA area to determine the current status of the species at the site (SJM Biological Consultants, 2002). A survey for determination of the potential effect of the removal action on the Santa Ana River woolly-star was conducted by Earth Tech biologists in July 2003. A formal consultation is being scheduled with the USFWS to determine the project impact on these species.

2.2.1 Agency Consultation and Permits

Prior to any irreversible or irretrievable commitment of resources to any project action that could adversely affect protected species, consultation with the United States Fish and Wildlife Service (USFWS), under Section 7 of the Endangered Species Act (ESA), and the California Department of Fish and Game (CDFG), under Title 50 Code of Federal Regulations (CFR) Part 17 Subparts C and D, as applicable, will be completed. Federal and state permit requirements will be determined through consultation with these agencies. Any required permits will be obtained. In addition to the mitigation measures currently listed in this document, the removal action will be subject to any additional mitigation measures that are determined to be required during this consultation and permitting process. This will result in minimum habitat disturbance for threatened species.

Earth Tech will also assist the Air Force in obtaining any permits that may be necessary to gain access to the affected area south of the base boundary.

2.3 PRE-REMOVAL TOPOGRAPHIC SURVEY

A site topographic survey will be conducted prior to the start of excavation activities. This will provide the data necessary to allow for the site restoration process to approximate the original grade and layout of the site. In addition, landmarks such as roads, fences, aboveground utilities, and buildings will be surveyed within the site boundaries. The survey will use the California State Plane coordinate system based on the North American Datum of 1983 (NAD 83), and will be conducted by a Registered Land Surveyor licensed

in the State of California. Upon completion of the survey, a topographic map of the site at a scale of 1:1200 (1 inch equals 100 feet) will be developed.

2.4 DEFINITION AND ESTABLISHMENT OF PROPOSED REMOVAL AREAS

Markers establishing the anticipated extent of soil removal will be installed prior to the start of excavation activities and will be based upon the areas of dioxin/furan or metals contamination as determined from previous sampling (CDM Federal, 1995b and 2000a). For Site 10, the boundaries will be established such that they include all of the area that was previously identified to be excavated and removed, as well as a buffer zone of at least 25 feet beyond the expected limit of removal. The extension of the boundary limits will provide for a safety buffer zone around the work areas and will allow for ease of additional excavation, if required. Previous sampling locations will be located and the associated analytical results will be used to guide the placement of the markers. The extent of the removal area will be determined by the accepted 10 ng/kg dioxin/furan concentration cleanup level; an approximation of the area is displayed in Figure 2-1. The removal extents may be expanded as determined by confirmation sampling after the completion of the initial excavation.

For Site 12, the removal area will be determined primarily by the sampling locations SS-5 and SS-7 where the metals lead, cadmium, nickel, and arsenic were found at concentrations in excess of the residential PRGs. The depth of removal for the two "hot spots" at this site are expected to be approximately 6 feet bgs, and the total area is roughly 1,500 to as much as 1,800 square feet (Figure 2-2).

2.5 GEOPHYSICAL CLEARANCE

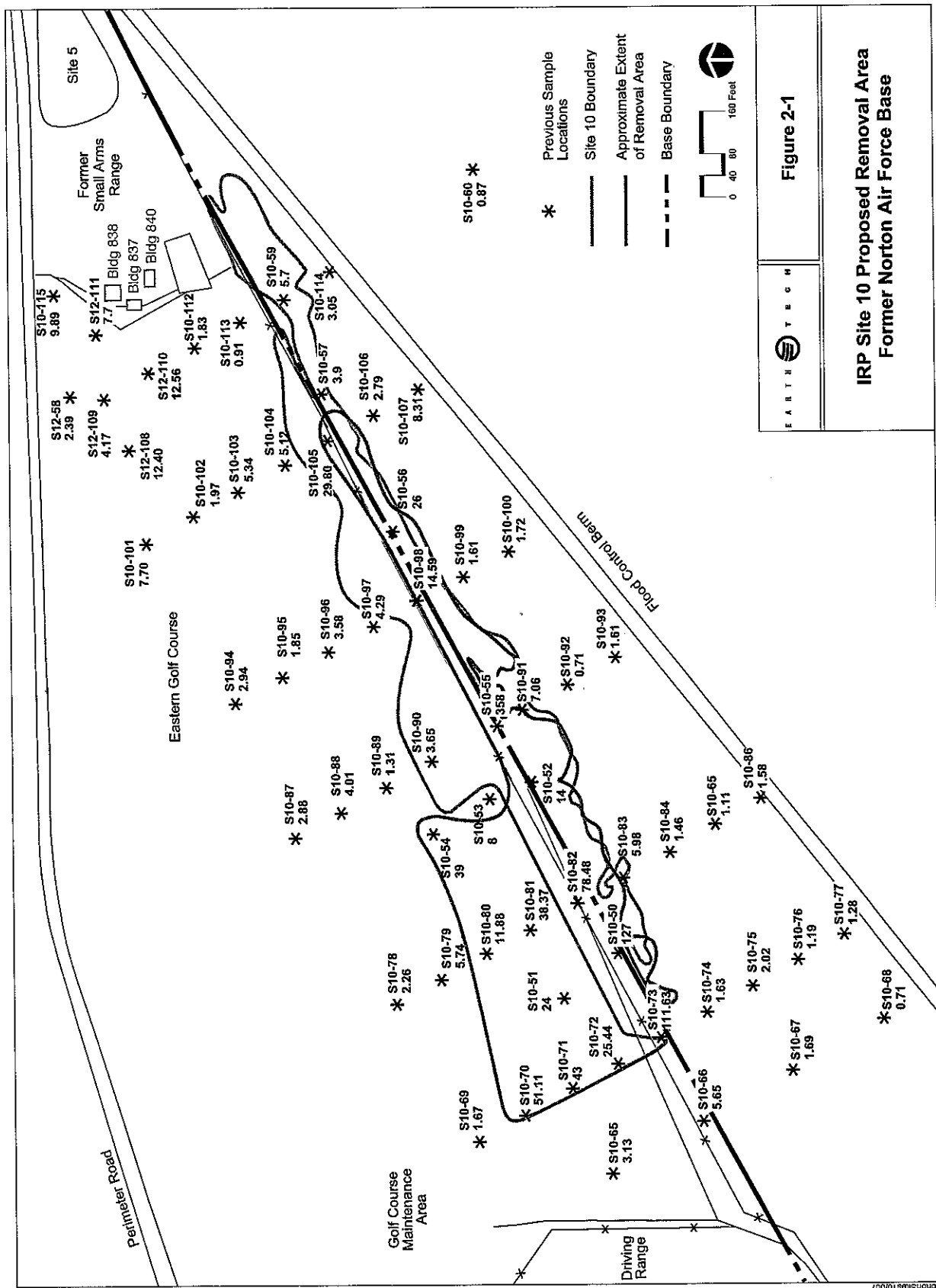
After the boundary of the contaminated area has been established, a geophysical survey of the areas to be excavated will be made prior to the start of work. The survey purpose will be to locate any potential underground utilities or other obstructions that could impact the planned activities and aid in preventing potential damage. The results of the survey will be compared to existing utility maps, information provided by management of the golf course adjacent to Sites 10 and 12, and maps provided by Dig Alert. Utilities will be clearly marked with stakes. Essential utilities, if found, will be rerouted during the excavation activities. It is anticipated that no major utilities will be found within the area of interest. This work will be in addition to clearances obtained during prefield activities.

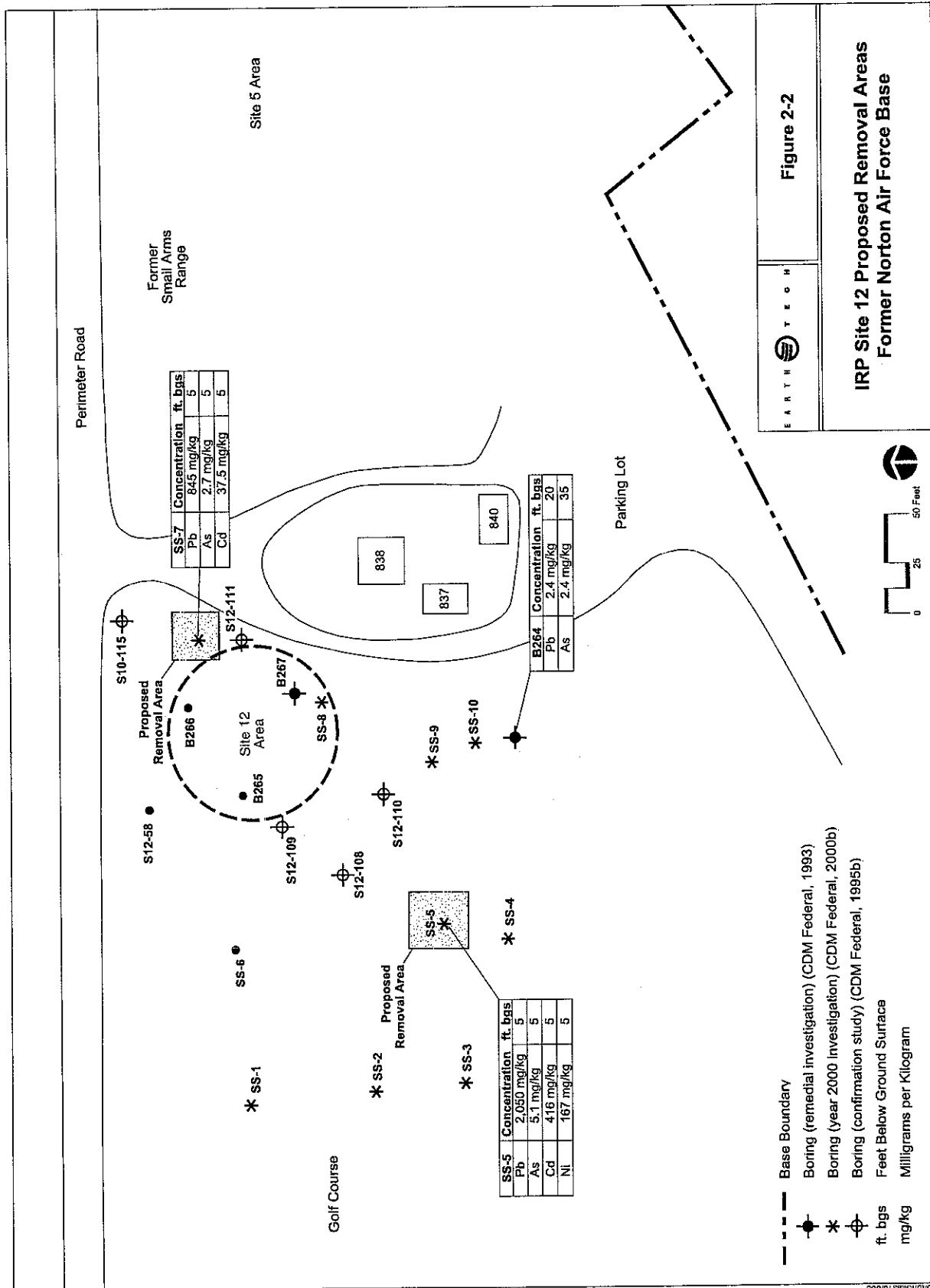
Dig Alert will be contacted and informed of the proposed work along with the location of the excavation site. Earth Tech will coordinate with those utility companies that may have underground piping or wiring at the site.

The Palm Meadows golf course management will be made aware of the scope of the removal action and potential impacts on the irrigation system of the golf course. Main water lines will be located and protected. Irrigation lines for the affected golf holes will likely be destroyed during the excavation activities; however, they will be replaced during the landscape restoration activities.

2.6 MOBILIZATION

Mobilization to the site will be accomplished by the subcontractor moving the appropriate equipment to the site, establishing appropriate security and access controls, and providing adequate waste material truck transports or storage bins. Earth Tech will mobilize appropriate sampling equipment and supplies, and establish a decontamination area.





The subcontractor will provide all equipment necessary to execute the proposed field work and complete the project in a timely manner. Equipment will be selected with adequate capability and capacity to perform the designated tasks. The following types of equipment are likely to be mobilized to the site:

- One or more excavators with an attached excavation bucket
- Backhoe
- Bulldozer
- Loader
- Compactor
- Trucks and trailers for material transportation
- Water truck.

The equipment at the site will be stored at a centralized staging area and used as necessary.

2.6.1 Site Setup and Temporary Facilities

General site setup includes establishing an access route into the site, a central work station, and temporary fencing and access gates; implementing site security and health and safety monitoring procedures; and establishing a transportation staging area, contaminant reduction zone, the limits of the work or exclusion zone, sanitary facilities, and decontamination areas. Portable fencing will be erected around the potential excavation zone, providing adequate room to operate machinery and hauling equipment, but also establishing an area of security to prevent non-authorized personnel from entering the site and being subjected to potentially dangerous conditions. Also, utilities will be connected as necessary to provide adequate electricity for pumps and other equipment, but also water for dust control, and equipment and vehicle decontamination. Temporary holding tanks will be used to store decontamination water.

The use of a temporary stockpile area for excavated soil is not anticipated for soil with dioxin/furan contamination. Sufficient analyses have previously been performed to adequately characterize the soil for disposal; therefore, excavated soil will be loaded onto transport trucks as it is removed. Trucks will leave the location when full and will transport the waste soil to the final approved disposal site. At Site 12, the metals-contaminated soil is expected to be less than 500 cubic yards (cy). The affected soil will be excavated and transported to a spot at Site 10 that is contained within the proposed removal area. The stockpiled soil waste will be characterized prior to its transportation to a disposal site. Based on the high concentration of lead found at sampling location SS-5, the soil associated with this site could potentially be classified as hazardous.

Dust control will be implemented during mobilization and during all phases of excavation and backfill activities. Dust will be controlled in accordance with South Coast Air Quality Management District (SCAQMD) rules 402 and 403. Water will be applied to excavated materials and to the excavation to reduce dust emissions to below those specified. Visual inspection will be used to identify any dust problems. Measures to control dust will include spraying water on dust sources, applying dust-suppressing agents, covering dust sources, and stopping work. Over watering soils will be prevented to avoid creating muddy conditions and potential damage from heavy equipment. Any stockpiles of soil will be covered with plastic when work is not occurring on them.

2.7 TEMPORARY EROSION CONTROL

Temporary controls to prevent erosion will be installed if necessary. Any potential erosion at the sites is expected to be inconsequential during both the excavation and backfilling activities. The most probable

form of erosion will be due to wind and wind gusts. The dust control measures discussed above will likely be sufficient to control this type of erosional process.

2.8 CLEARANCE OF VEGETATION, BRUSH, AND OTHER SURFACE DEBRIS

The sod associated with the golf course portion of the excavation area will be scraped from the zone of excavation and removed, hauled, and disposed of properly. Soil near trees and ornamental shrubs growing on the golf course portion of the excavation will be pulled away from the tree or shrub. Damage to roots will be minimized and the tree or shrub preserved where possible.

All vegetation within the environmentally sensitive area, including the woolly star habitat, will be carefully removed, stored, and, at the conclusion of the removal action, mulched for distribution across the affected sensitive area.

2.9 WASTE MANAGEMENT

All wastes produced during the removal, sampling, and restoration activities will be handled in accordance with state and federal regulations and will be sufficiently identified, characterized, and transported off site within 90 days for disposal at a licensed facility. Properly executed Uniform Hazardous Waste Manifests will accompany all waste shipments off site.

Contaminated or waste soil will be profiled using the analytical data obtained during past investigations, as well as analyses of profiling samples collected from various waste soil stockpiles. The waste soil disposal facility will likely require waste profile sampling and analysis for one or more potential contaminants, including metals and total petroleum hydrocarbons. Based upon concentrations of dioxin/furan detected in previous investigations at Site 10, Earth Tech does not anticipate that the excavated soil will be hazardous. During the soil excavation activities, stockpiling of soil is planned, followed by waste profile sampling. Upon receipt of profiling analytical results the soil will be loaded on trucks and transported off site by a licensed waste transport subcontractor to an approved licensed waste handling facility or recycling center.

At Site 12, analytical data from one sample indicates that lead concentration exceeds 2000 mg/kg. As discussed above, the excavated soil from this "hot spot" will be temporarily stockpiled within the proposed removal area at Site 10. Waste characterization soil samples will be collected from the stockpile and analyzed for potential contaminants, including metals and total petroleum hydrocarbons to determine the disposal classification for this soil. Based on the analytical results, disposal options will be reviewed and the appropriate one selected. Once the stockpile has been removed, the plastic will be collected and disposed.

Additional characterization data obtained from profiling samples collected from the waste soil will be compared to California Code of Regulations (CCR), Title 22 criteria to determine where the waste can be properly disposed. It is anticipated that the soil waste will be classified as nonhazardous.

Waste soil will be stockpiled; however, solid wastes such as construction rubble and other non-soil waste will be stored on site in roll-off bins lined with polyethylene or polyvinyl chloride liners, and all liquid wastes from decontamination activities will be stored in approved holding tanks or 55-gallon drums. Wastes consisting of personnel protective equipment (PPE) will be stored in heavy duty plastic waste bags for transportation to an approved landfill.

Liquid wastes generated from decontamination activities will be characterized for dioxins/furans, total hydrocarbons, and metals per CCR Title 22, by collecting a composite sample from the holding tanks or 55-gallon drums. None of the liquid waste is expected to be classified as hazardous. Liquids will be transported off site by the licensed waste transport subcontractor to an approved and licensed waste handling or treatment facility, as required. Labeling of all waste containers on site will be in accordance with the procedures as described in Attachment C-ENV 207 of the HSP.

2.10 EXCAVATION AND TRANSPORT OF SOIL

2.10.1 Removal of Overburden

As shown in Figure 2-1, a portion of the area with contaminated soil exceeding the cleanup goal lies in one or more fairways of the golf course. The golf course was developed after Sites 10 and 12 were no longer being used. As such, clean soil was placed in the fairway areas as well as for building greens. During previous investigations, an interface between the base of the sod and the native soil has been apparent (CDM Federal, 2000a). It is anticipated that the sod from the fairway will be removed to a depth of between 6 inches to 1 foot bgs, and disposed of. Characterization of the sod may be required as determined by the waste disposal facility.

The area south of the golf course perimeter fence contains construction debris consisting largely of waste concrete. Most of the waste appears to be at or very near the surface. The debris consisting of large concrete blocks easily removed from the soil will be removed and transported to a waste disposal or recycling facility. None of the soil in this area will be considered overburden, but rather all soil will be considered as part of the removal action.

2.10.2 Removal of Contaminated Soil

Dioxin/furans-contaminated soil will be removed within the removal area boundary at Site 10 to an anticipated average depth of two feet bgs. Previous investigations have shown that dioxin/furan contamination is confined primarily between the surface and two feet bgs, except within some areas of limited extent where contamination was found to be as deep as 4 feet bgs (CDM Federal, 2000a). Intervals greater than 2 feet bgs may be removed based upon previous sampling, field screening of soil samples, and the presence of ash layers. A previous study found a positive correlation of dioxin/furan and metals concentrations with the presence of one or more ash layers (CDM Federal, 2000a).

Soil removal at Site 10 will initially be guided by the extent of dioxin/furan-contaminated soil with concentrations exceeding the TEQ concentration of 10 ng/kg, as determined during previous studies (see Figure 2-1). Analytical results from soil samples collected during these previous studies appear to indicate limits where dioxin/furan contamination is below the action level of 10 ng/kg (CDM Federal, 2000a). Once the estimated boundaries of the contamination are reached, confirmation samples will be collected to show that the goals of the removal action have been met, or guide additional soil removal if contamination exceeding cleanup goals still exists. Samples will be analyzed for dioxins/furans isomers at Site 10, and for metals at Site 12. The turnaround time for analytical results will be important in order to minimize the "down" time of the golf course operations. Earth Tech will strive to have preliminary sampling results from the laboratory between 72 to 96 hours after the collection of the sample. If sampling results indicate that excessive contamination remains, additional excavation will occur. Excavation will proceed at 5-foot increments laterally in all four cardinal directions from the sampling location, and in 2-foot increments vertically beneath the sampling location (see Section 3.2). Prior investigations suggest that little additional amounts of soil will require removal beyond the currently estimated extents. The total volume of soil to be

removed is currently estimated to be 20,000 cy or less, based upon an area of 247,536 square feet and an average depth of 2 feet bgs

Sloping of the sides of the excavation will not be necessary since the total depth of removal will generally not exceed 2 feet bgs. However, if depths reach 4 feet bgs or greater, the sides of the excavation will be sloped (1:1) or benched if personnel need to enter the excavation for any reason, in accordance with Occupational Safety and Health Administration (OSHA) standards. Soil removal around trees will progress in such a way as to avoid major damage to the tree roots or cause structural weakness. Since the depth will likely be 2 feet or less, it is anticipated that the loss of trees will be minimal.

At Site 12, excavation or "hot spot" removal is expected to be contained to the two small areas represented by the previous sampling locations SS-5 and SS-7, with a total excavation depth of approximately 5-6 feet bgs. The excavation will be sloped (1:1) if personnel need to enter the excavation for any reason in accordance with OSHA standards. Soil removed from this site will be temporarily stockpiled at Site 10 pending results of waste characterization sampling. The concentration of lead contamination at the "hot spot" has a potential to be high enough to classify the soil from this site as hazardous. The volume of soil from the "hot spot" removal will likely be less than 500 cy.

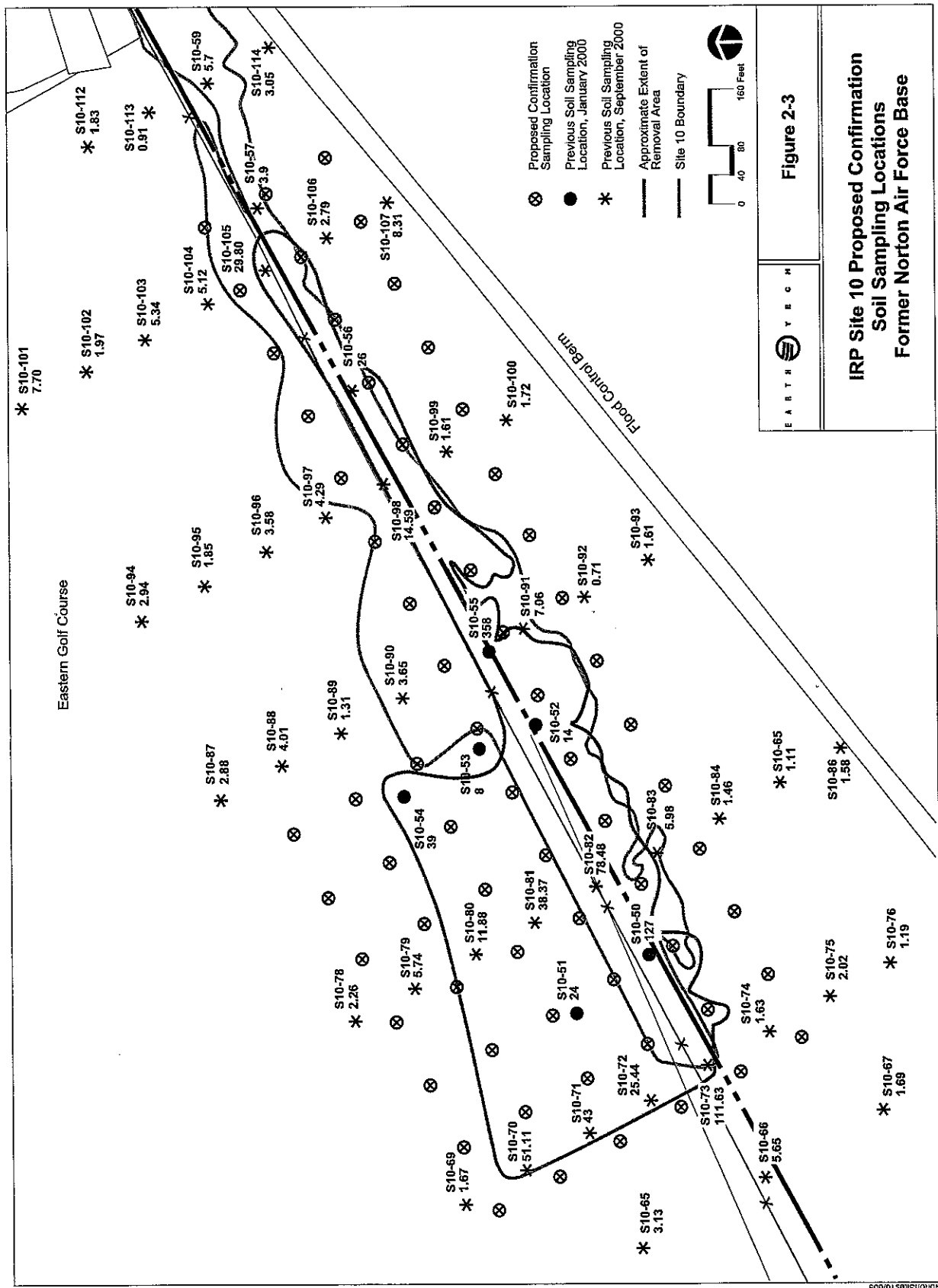
As soil is removed from Site 10, it will be placed in stockpiles and waste profile samples collected for shipment to the off-site laboratory. After the waste soil profile analytical data have been received, trucks will haul the soil to the appropriate disposal site. As the trucks leave the excavation site, they will pass over a cleaning grate to aid in removing site soil from the truck tires. During main events, work will be halted. Removal of soils will not be conducted in standing water. If the cleaning grate is not sufficient to remove wet soil from the truck tires, a pressurized water hose will be used to clean the tires prior to the trucks leaving the site. It is currently expected that the analytical results from past sampling will be sufficient to characterize the soil for disposal off site from Site 10. However, the disposal facility may require additional analytical data to characterize waste soil. Waste soil characterization samples will be collected and analyzed for the chemicals-of-concern as necessary.

When soil excavation has been deemed complete, all excavation equipment and trucks will be decontaminated with high-pressure low-flow washers. The process will consist of thoroughly washing equipment faces, wheels or tracks, and other exposed equipment surfaces to remove potentially contaminated soil. A non-phosphate detergent will be used as the cleansing agent. All decontamination water will be collected and transferred to holding tanks or 55-gallon drums.

2.11 POST-REMOVAL CONFIRMATION SAMPLING

After excavation is complete a final round of soil sampling will be conducted to establish the profile for any remaining dioxin/furan and metals contamination and will provide the necessary data to confirm that potentially harmful levels of the contaminants have been removed. Soil samples will be collected at various points in the bottom of the excavations and at the surface just beyond the furthest reaches of the excavated areas. Because the excavation depth is expected to be shallow (approximately 2 feet bgs) and the local soils are sandy and unconsolidated, excavation walls will likely not exist at Site 10.

Confirmation sampling will be performed based on a systematic sampling approach whereby the sampling locations will be distributed across the excavated area in a grid pattern. It is expected that approximately 66 sampling locations will be established across the removal area at Site 10 (Figure 2-3). The cleanup standard for dioxin/furan will be based on the Basewide Feasibility Study (CDM Federal, 2003) TEF concentration of 10 ng/kg. For metals at Site 12, approximately 5 sampling locations will be established at



each of the two removal areas (Figure 2-4). The cleanup standards for metals will be based on residential PRGs or background concentrations established for the former Norton AFB area (CDM Federal, 1995a).

Confirmations samples will be collected using a No. 10 sieve (2.0 millimeter [mm]) so that coarse sand and rocks are minimized, and that a more representative sample of fine material, including ash, is ultimately sent to the laboratory for analysis. If the resulting analytical results indicate contamination remaining at concentrations exceeding the cleanup goals, additional soil will be removed from around and below that sampling location (see Section 3.2) and repeat confirmation sampling will be conducted.

2.12 POST-REMOVAL TOPOGRAPHIC SURVEY

Prior to placing backfill material in the excavated areas, a site topographic survey will be conducted delineating the lateral and vertical limits of each excavation, and will provide an estimate of the total volume of soil removed. Also, the survey will establish the horizontal and vertical locations of confirmation soil sampling points. The survey will be conducted by a licensed land surveyor.

2.13 SOIL BACKFILL AND COMPACTION

After the site cleanup goals have been attained as evidenced by analytical results from confirmation sampling, and after the post-removal survey has been completed, the excavation will be backfilled with uncontaminated commercial fill material imported to the site. The material will be obtained from as nearby a source as possible. Certification that the material comes from an uncontaminated source such as a quarry will be required. Because the native material is primarily sand, minimal compaction will be required. Backfilling will continue until the excavation has been filled to the approximate grades and elevations as were originally documented. Actual backfilling of soil will occur in 1-foot lifts or less, and, where necessary, compacted to 90 percent of maximum dry density using accepted methods.

2.14 SITE RECONSTRUCTION

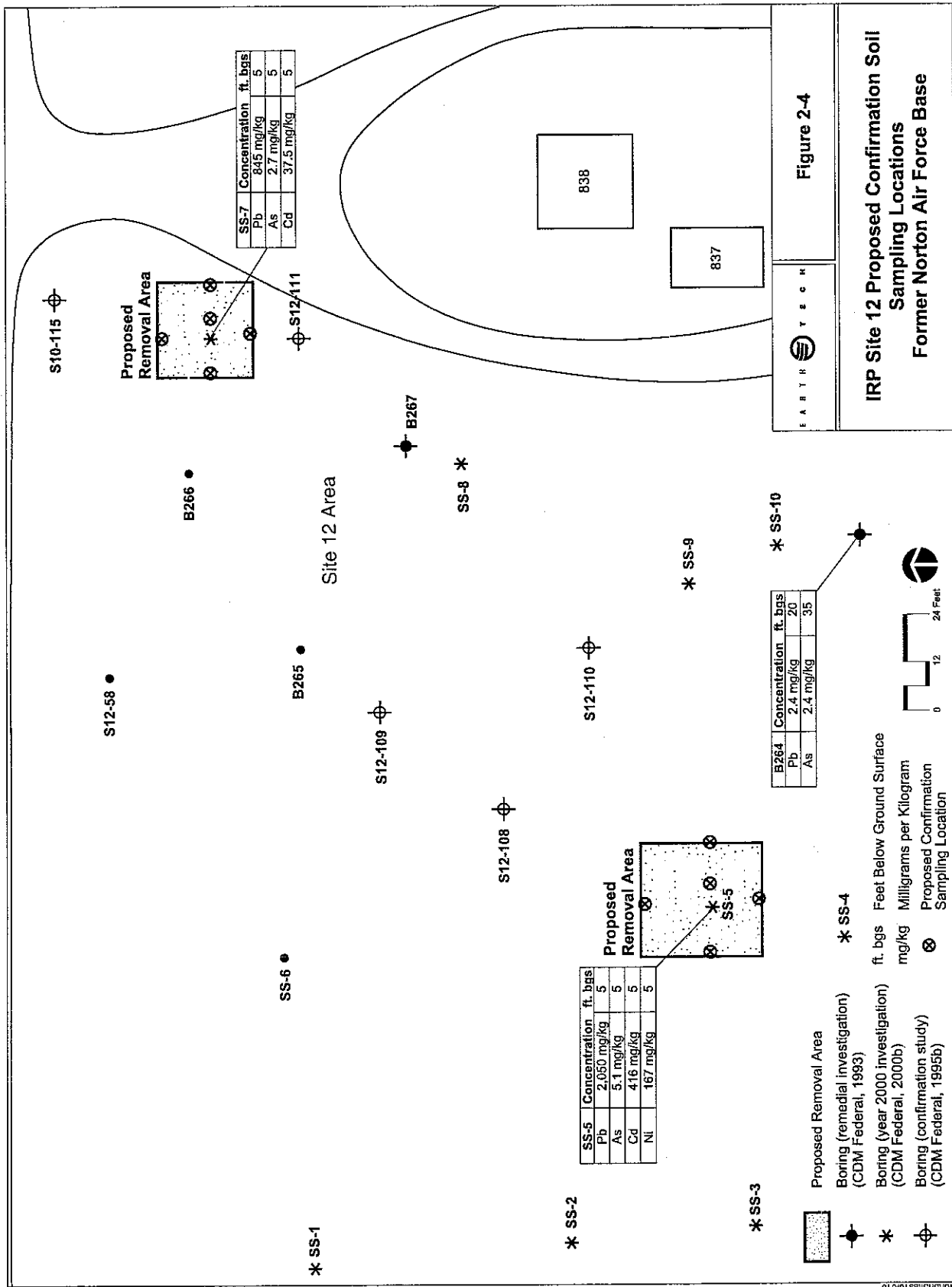
2.14.1 Restoration of Site Features

Site reconstruction will be accomplished by restoring the disturbed areas back to the condition prior to soil excavation and removal. In particular, structures such as fencing between the golf course area and the river channel will be erected along the same line as previously established, and in compliance with legal property boundaries. The affected part of the perimeter road at the south edge of the golf course will be graded, leveled, compacted, and covered with course gravel.

2.14.2 Site Revegetation

Upon completion of the backfilling, compaction, and grading activities the sites will be reestablished with vegetation common to each area. For the golf course portion of the excavated area, irrigation piping and sprinkler heads will be installed, and the turf reestablished by installation of sod according to specifications as determined by the golf course management. This will minimize the time required to return the golf course to full playing condition.

Once backfill soils are replaced on the site and the area is leveled to approximately the original grades in environmentally sensitive areas, previously removed vegetation will be mulched and evenly spread over the site. This measure will allow pre-existing vegetation an opportunity to naturally revegetate the site.



2.15 DEMOBILIZATION OF EQUIPMENT

Upon completion of all removal and restoration activities, excavation equipment, graders, and trucks will be removed from the site. All temporary structures, including security fences, gates, and toilet facilities, will be removed. All waste containers, including temporary holding tanks, drums, and trash bins, will be removed as well. Temporary utility conduits will be disconnected and removed.

2.16 PREPARATION OF REMEDIATION VERIFICATION REPORT

After the planned remedial action has been completed, an RVR detailing each activity performed will be prepared. The RVR will include evaluation of data collected during the removal action and conclusions regarding whether the objectives of the remedial action were attained. Also, the report will list all chemical analytical results in tabular format, data validation qualifiers, site diagrams depicting the final sampling points and lateral extent of soil removal, site photographs, copies of waste manifests, and any other pertinent data.

3.0 SAMPLING AND ANALYSIS PLAN

This section presents the various aspects of the sampling methodology to be employed during the removal of the dioxin/furan-contaminated soil at Site 10 and the removal of metals contaminated soil at Site 12. It is anticipated that confirmation soil samples will be collected for the purpose of confirming that soil contaminated with dioxins/furans and metals has been removed to a degree sufficient to reduce both human health and ecological risks to acceptable levels. Sampling locations, frequency, matrix, and analytical methods are discussed below. This work plan will follow the Final Sampling and Analysis Plan for the Basewide Groundwater Monitoring Program and Water Supply Contingency Policy, Groundwater Sampling Program, Norton AFB (Earth Tech, 2001) and the Quality Assurance Project Plan (QAPP) for the AFCEE version 3.1 (AFCEE, 2001), unless noted otherwise. Chemical methods and analysis to be performed on the confirmation samples collected are listed in Table 3-1.

Table 3-1. Chemical Methods and Analysis For Soil at Sites 10 and 12

Analysis	Method Numbers	Sample Matrix
Dioxins and Furans	EPA SW-846 8290	Soil
California Metals (includes mercury)	EPA SW-846 6010B/7471A	Soil

Duplicate soil samples will be collected at a frequency of 10% of the total number of primary samples

3.1 SAMPLE IDENTIFICATION

Samples will be assigned a specific identification (ID) number to uniquely represent each sample and be recorded on the sample container itself, as well as the CoC form, field logbook, and other project records. The sample ID will also associate the sample with the study site. The sampling ID assignment method is provided below:

Norton-##-- @@####--AA####--D##

where:

= Site Number (10 for IRP Site 10, 12 for IRP Site 12)

@@ = 'CS' for confirmation soil sample

= consecutively numbered sampling locations

AA = SS for soil sample

= consecutively numbered sample

D## = depth of the sample (D00=surface, D02=2 feet bgs, etc)

Therefore, the first confirmation surface soil sample collected from Site 10 would be designated as "Norton-10-CS001-SS01-D00". The first and second confirmation samples collected from the surface and 4 feet bgs at a location at Site 12 would be designated as "Norton-12-CS001-SS01-D00" and "Norton-12-CS001-SS02-D04."

Duplicate samples will be collected for 10 percent of all primary samples collected and will be submitted to the laboratory blind such that laboratory personnel will not have knowledge of the particular duplicate. For samples collected at the bottom of excavations, the depth of the excavation relative to ground surface will be used. All soil samples will be collected using disposable scoops so that no decontamination of sampling equipment is anticipated. Samples will be placed in certified precleaned jars for transportation to an off-site laboratory.

3.2 SOIL SAMPLING PROCEDURES

Confirmation soil samples will be collected after the contaminated soil has been excavated and removed from the site. Samples from the base and walls or lateral extent of the excavation will be collected for the purpose of determining if contamination has been removed to acceptable levels. The depth of excavation at Site 10 will likely average 2 feet bgs or less and as such, excavation "walls" will likely be gradational. At Site 12 the excavation will be 5-6 feet bgs and sampling will occur near the base of the excavation "wall".

At Site 10, previous investigations have established that the area containing dioxin/furan contamination in excess of 10 ng/kg is approximately 5.7 acres (see Figure 2-1) (CDM Federal, 2000a). At Site 12, the two "hot spot" areas with metals contamination together cover approximately 1,500 square feet. After the areas have been excavated to the extent indicated by previous soil analytical results for dioxins/furans and metals, confirmation samples will be collected to characterize the remaining soil. If the analytical data from confirmation samples show that remaining areas of soil have dioxin/furan or metals exceeding the cleanup goal, excavation will continue in 5-foot increments laterally in each of the four cardinal directions around the location of the detected contamination, and 2-foot increments vertically beneath the location of the detected contamination (a total of approximately 7.5 cubic yards). Following incremental removal of soil, more confirmation samples will be collected as before. This cycle will continue until the analytical results indicate that the extent of the excavation has removed enough soil to meet the cleanup goals, at which time excavation will cease and any additional confirmation sampling will take place. Additional removal will not be conducted within sensitive habitat areas beyond that which has been approved by the USFWS. Soil removal will also be limited to the extent that further operations are safe and feasible.

Sampling locations will provide analytical data to be used to verify the removal of dioxin/furan-contaminated soil at Site 10. Confirmation soil samples will be collected along the bottom and sides of the excavation using a grid system to determine the location of each sample. One hundred-foot by 100-foot grids will be marked out over the site using an established starting survey point, and discrete soil samples will be collected at the corners of each grid. This approach is designed to detect post-removal dioxin/furan concentrations in the soil exceeding the cleanup goal before the excavation is backfilled. Figure 2-3 depicts the approximate layout of the sampling grid and the sampling locations based on the proposed removal area at Site 10. Based on the grid, 66 soil samples will be collected from the excavation at Site 10. The samples from this grid will be analyzed for dioxins/furans using U.S. EPA Method 8290.

At Site 12, five confirmation samples will be collected from each "hot spot" excavation to determine if elevated metals concentrations have been removed to acceptable levels. One sample will be collected from the center, and one each from the four sides of the excavation. The samples will be analyzed for metals using U.S. EPA Method 6010B. Figure 2-4 displays the location of the samples in each of the two excavations. Table 3-2 includes a summary of the soil samples to be collected and the associated analyses for both Sites 10 and 12. Sampling locations at both sites may vary slightly based on field conditions, and the final location will be determined by the field manager.

Table 3-2. Proposed Confirmation Soil Sampling Locations

Proposed Sample Location and ID	Sample Type	Dioxins/ Furans	Metals*	Comments
IRP Site 10				See Figure 2-3 for approximate locations
10-CS01-SS01	Soil	X		
thru				
10-CS73-SS01	Soil	X		For Site 10, 73 samples total including 7 duplicates
IRP Site 12				See Figure 2-4 for approximate locations
12-CS-01-SS01	Soil		X	
12-CS-02-SS01	Soil		X	
12-CS-03-SS01	Soil		X	
12-CS-04-SS01	Soil		X	
12-CS-05-SS01	Soil		X	
12-CS-06-SS01	Soil		X	
12-CS-07-SS01	Soil		X	
12-CS-08-SS01	Soil		X	
12-CS-09-SS01	Soil		X	
12-CS-10-SS01	Soil		X	
12-CS-11-SS01	Soil		X	For Site 12, 11 samples total including 1 duplicate

*California metals consist of 17 priority pollutant metals including mercury

Sample locations are generalized and as such, are for planning only. Final sampling locations may vary.

After soil from the contaminated areas at Sites 10 and 12 is removed, pre-packaged plastic disposable trowels will be used to collect the confirmation soil samples from the newly exposed surface of the removed area. Soil will be placed into a No. 10 sieve to collect that portion of the matrix equal to or less than 2 mm in size. The material passing through the sieve will be collected in a sieve pan. If additional sample material is needed, more soil will be scooped from the sampling location and placed in the No. 10 sieve until enough has been collected to fill the sample container. This procedure will ensure that adequate amounts of fine material will be available for laboratory analyses. The sieved soil will be placed in the appropriate glass jars according to the analysis to be performed. Once the jar is full of soil, the lid will be placed on the jar and the sample label will be filled out with the appropriate sample identification number along with the date and time collected. Each sample will be recorded in the logbook according to its sample ID designation, place of collection, and time of collection. The sample will then be placed in a plastic zip-lock baggie and placed into an ice chest containing ice. Once all samples have been collected, chain-of-custody (CoC) forms will be filled out and the samples will be shipped to the laboratory for analysis of dioxins and furans using U.S. Environmental Protection Agency (EPA) Method 8290, or California metals including mercury using U.S. EPA Methods 6010B and 7471A. The analytical data from these samples will be used to confirm that contaminated soil has been removed to the extent that the cleanup criteria has been met. The turn-around time for preliminary data to be returned is anticipated to be between 72 and 96 hours based on discussions with the laboratory. A quick turn-around time is essential to minimizing the financial impact of the RA on the golf course facility.

3.3 SAMPLE CONTAINERS, PRESERVATION, AND HANDLING

Sample containers will consist of 16-ounce glass jars for soil collected using the disposable trowels and No. 10 sieve. Sample labels will be affixed to all sample containers and will clearly display the sample identification number along with the collection time and date. Containers will be shipped from the laboratory and will contain the necessary preservatives according to their intended use. Samples will be shipped in coolers packed with ice to assure the proper temperature, with CoC forms and custody seals. Logbooks will contain a record of all sample collection locations, time, and other pertinent observations and will serve as the permanent record of all field activities.

3.4 FIELD DOCUMENTATION

Field activities and other pertinent information will be documented in a waterproof, permanently bound field logbook with consecutively numbered pages. Entries will be printed with a waterproof black ink, and signed by the person recording the information. Recorded information in the log book will include the following, where appropriate:

- Names of each person on the field team, along with a field title and brief description of each person's responsibilities
- Date of entry, weather conditions, other environmental conditions
- General description of daily field activities and associated times of occurrence
- Field equipment calibration
- Estimates of quantity of soil removed, if any
- Collection location, time, and identification for all samples collected
- A sketch map of each sample location, with the sample depth and position relative to a known permanent reference location
- Identification of persons and times of entry and exit from the site.

3.5 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

3.5.1 Duplicate Samples

Duplicate samples will be submitted to the laboratory along with other samples to assess the overall precision of the sampling and analysis process. Duplicates will be collected at a minimum rate of 10 percent of the investigative samples for all soil analysis. These samples will be submitted blind along with the other samples so that the laboratory will not know which of the samples are duplicates. The collection and identification of the duplicates will proceed in the same manner as the collection of the other samples.

3.5.2 Matrix Spike/Matrix Spike Duplicate Samples

As required by the analytical protocol, additional sample volume will be needed for collection of a matrix spike/matrix spike duplicate (MS/MSD). The MS/MSD sample should not contain the contaminant of

interest, and preferably be clean yet representative of the sample matrix. The total number of MS/MSD samples will be at a minimum frequency of 5 percent of the total samples collected

3.6 EQUIPMENT DECONTAMINATION

Sampling equipment will be of the disposable type and as such will require no decontamination. No other sampling equipment requiring decontamination will be used.

3.7 SAMPLE CUSTODY

3.7.1 Chain-of-Custody Procedures

CoC procedures will be used to document and identify each sample, its handling, and possession, including the time from collection through the arrival at the laboratory for analysis. CoCs will trace each sample through the transfer process, and identify separate possessions along the route. CoC forms will be filled out and will usually account for multiple samples. CoC forms will clearly identify the project name, the samplers or sample collectors, the sample ID, date and time of collection, the matrix, numbers and types of containers, and the analyses required. In addition, each CoC will provide sufficient signature spaces to properly account for each transfer point and the person responsible. A laboratory signature space will be used to show acceptance of the samples by laboratory.

3.7.2 Sample Labels

All samples will have sample labels securely attached, and will display the pertinent information from the collection process in the field. Each sample label will include the identification number, the date and time of collection, identification of the sample collector, the sample matrix, preservatives used, and the required analyses.

3.7.3 Custody Seals

Custody seals will consist of strips of adhesive paper and are used to show that the sample has not been tampered with during shipping. The seals will be placed on each sample container lid or other type of opening to show that the sample has not been accessed after collection. In addition, custody seals will be used to seal the lid of each cooler prior to shipment.

3.8 LABORATORY ANALYTICAL PROCEDURES

For all soil samples, dioxins and furans, and California metals including mercury will be analyzed by U.S. EPA SW-846 Methods SW8290, and SW6010B/SW7471A, respectively.

3.9 QUALITY ASSURANCE PROCEDURES

Samples will be collected for quality control (QC) and will be representative of each sample matrix. Laboratory analysis of all samples will be for dioxins/furans and California metals.

3.9.1 Data Quality Objectives

The data quality objective (DQO) process provides a method for developing the technical approach used to design an investigation. The data collected during the field investigation will be used to document the soil conditions at Sites 10 and 12 after the soil removal action has been completed. In addition, the data

may be used to support post-closure risk analysis as necessary. The seven-step DQO process is presented below

Step 1. State the problem. IRP Site 10 is the location of a former surface landfill used for the placement of concrete and asphalt debris, as well as construction wastes, trees, and brush. Burning of the trees, construction debris, and other combustible wastes occurred in the past as evidenced by layers of ash in the soil. IRP Site 12 is adjacent to Site 10 and is a former waste pit. In addition to waste disposal at the site, it was reported that wastes were burned at this location as well (CDM Federal, 2000a). Soil sampling during past investigations led to removal of "hot spots" at Site 10 contaminated with one or more metals (Bechtel, 1998). During its review, DTSC identified the absence of dioxin/furan data from soil as a deficiency for both Sites 10 and 12. The rationale for this conclusion is based upon the potential for production of dioxins/furans as a byproduct of burning of wastes; additional sampling for dioxins/furans was recommended. In response, two separate sampling efforts were completed to characterize dioxin/furan concentrations in the soil. Results indicate that dioxins/furans exist at Site 10 at concentrations in excess of cleanup goals established between the Air Force and regulators, and subsequent risk analysis indicates that a removal action is warranted (CDM Federal, 2003). Risk analysis also indicates risks in excess of residential based standards located within two metals contaminated "hot spots" at Site 12. The "hot spots" were found based on analytical results obtained from soil samples collected during a previous study (CDM Federal, 1995b).

This remedial action work plan provides for removing the remaining dioxin/furan-contaminated soil in excess of 10 ng/kg at Site 10, removing the two metals contaminated "hot spots" at Site 12, gathering analytical data from soil remaining after the removal action to confirm the reduction in contaminant concentrations, backfilling excavated areas with clean soil, and restoring the sites to as near as possible the original condition.

Step 2 Identify decisions. The primary decision questions for IRP Sites 10 and 12 are: 1) is the extent of dioxin/furan contamination at Site 10 and metals contamination at Site 12 limited to the extent previously identified? 2) how much total soil must be removed from the sites in order to lower the contaminant concentrations to cleanup criteria? and 3) how much risk does remaining contamination in the soil present to the sites? The accepted cleanup goals for dioxin/furan and metals are shown in Table 3-3.

Table 3-3. Contaminants of Potential Concern and Target Cleanup Goals

Contaminant of Potential Concern	Target Cleanup Goal* (mg/kg)
Dioxin/Furans	10 ng/kg**
Cal Metals	
Arsenic	1.5
Cadmium	9
Lead	160
Nickel	150

Note: * Target cleanup goals based on values established in the Basewide FS, for Norton AFB, CDM 2003.
** dioxin/furan value is the sum of the toxicity equivalent values for each of the isomers.
mg/kg = milligram per kilogram
ng/kg = nanogram per kilogram

Step 3. **Identify inputs to the decision.** Decision inputs will include the following:

- Previously collected soil analytical data for Sites 10 and 12
- Confirmation soil sampling analytical data after removal of soil has occurred at Sites 10 and 12
- The cleanup standard for the identified contaminants of potential concern (COPCs)
- QC oversight and field audits
- Results of independent data validation.

Step 4. **Define the study boundaries.** Initially, physical boundaries of the removal areas will be confined to Sites 10 and 12 as defined by previous investigations. At Site 10 this area comprises approximately 5.7 acres and will average approximately 2 feet in depth. The area may be expanded slightly as the removal action progresses. At Site 12 the "hot spot" areas are defined by two soil borings that were previously advanced, and will represent a combined area of 1,500 square feet or less. Areas adjacent to Sites 10 and 12 are not expected to be targeted for soil removal.

Step 5. **Develop a decision rule.** The decision rules for evaluating the success of the remedial action for soil at Sites 10 and 12, the potential expansion of the previously defined area of soil removal, and the amount of risk reduction from remedial action will be:

- Confirmation samples for soil will be collected after contaminated soil removal. If COPCs in the confirmation soil samples are detected at concentrations greater than the cleanup standard, additional remedial action may be warranted. If concentrations of COPCs in soil at Sites 10 and 12 do not exceed the cleanup standard, the site will be considered as having met clean closure standards.
- Confirmation soil samples collected from Sites 10 and 12 will extend the data set for analyzing the degree of risk present from COPCs contamination.

Step 6. **Specify tolerable limits on decision errors.** Statistically derived limits on sampling design errors are not quantifiable because a statistical design will not be used. A judgmental sampling design will be used instead. In sampling designs where conclusions are based on professional judgment, the decision errors are reduced by subjective definition of factual basis for the judgment. Sampling for this field investigation will be based on available knowledge of reported results from previous investigations as well as past activities and practices.

Measurement errors during the sample measurement process (sample collection, handling, preparation, and analysis; data reduction; and data handling) are possible regardless of sampling design. Measurement errors or variability cannot be eliminated but can be controlled by selection of sampling and analytical procedures and adherence to the field sampling plan, and to laboratory standard operating procedures (SOPs).

Step 7. **Optimize the design.** No statistical sampling will be conducted; therefore, statistical design is not applicable. The judgmental approach is designed to augment existing analytical data pertinent to IRP Sites 10 and 12, and provide additional data where needed to perform a post-remedial evaluation of soil conditions at the sites.

3.9.2 Data Measurement Objectives

Data measurement objectives define data quality requirements to be met in order to support the project DQOs. Data measurement objectives are the determinants of the quality of the data needed to support

specific decisions or regulatory actions. To assure attainment of the DQOs, the following data measurement objectives are to be considered:

- The specification of particular analytical method detection limit requirements
- The specification of particular reporting limit requirements
- The identification of the appropriate laboratory analytical QC requirements
- The selection of the appropriate levels of precision, accuracy, representativeness, completeness, and comparability (PARCC) criteria for the data
- Specific sample-handling issues or other project-specific issues.

The overall objectives are to assure that the collected data are of sufficient quality to support their intended use.

3.9.3 Quality Assurance Guidance

Analytical quality assurance (QA) will be performed in accordance with the following guidance and technical specifications:

- AFCEE QAPP, Version 3.1 (AFCEE, 2001)
- Final Sampling and Analysis Plan for Basewide Groundwater Monitoring Program and Water Supply Contingency Policy Groundwater Sampling Program, Norton Air Force Base (Earth Tech, 2001)

3.9.4 Precision, Accuracy, Representativeness, Completeness, and Comparability

The basis for assessing PARCC or elements of data quality is discussed at length in the AFCEE QAPP (AFCEE, 2001) and will be discussed briefly in this report.

3.9.4.1 Precision.

Precision measures the reproducibility of measurements. It is strictly defined as the degree of mutual agreement among independent measurements as the result of repeated application of the same process under similar conditions. *Total* precision is the measurement of the variability associated with the entire sampling and analysis process.

3.9.4.2 Accuracy.

Accuracy is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systemic error. It, therefore, reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike or standard.

3.9.4.3 Representativeness.

Objectives for representativeness are defined for each sampling and analysis task and are a function of the investigative objectives. Representativeness shall be achieved through use of the standard field, sampling, and analytical procedures.

3.9.4.4 Completeness.

Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples (e.g., by site). The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set.

3.9.4.5 Comparability.

Comparability is the confidence with which one data set can be compared to another data set. The objective for this QA/QC program is to produce data with the greatest possible degree of comparability.

3.9.5 Method Detection Limits, AFCEE Reporting Limits, And Instrument Calibration Requirements

3.9.5.1 Method Detection Limits.

The method detection limit (MDL) is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. The laboratory shall establish MDLs for each method, matrix, and analyte for each instrument the laboratory plans to use for the project. The laboratory shall revalidate these MDLs at least once per 1-year period. The laboratory shall provide the MDL demonstrations to AFCEE at the beginning of the project. Results less than or equal to the MDL shall be reported as the MDL value and flagged with a "U."

Laboratories participating in this work effort shall demonstrate the MDLs for each instrument, including confirmatory columns, method of analysis, analyte, and matrix (i.e., water and soil), using the instructions listed in the AFCEE QAPP (AFCEE, 2001). Estimated MDLs are in Table 3-4.

3.9.5.2 Reporting Limits.

The laboratories participating in this work effort shall compare the results of the MDL demonstrations to the reporting limits (RLs) for each method that is used. The MDL may not be more than one-half the corresponding RL. The laboratories shall also verify RLs by including a standard at or below the RL as the lowest point on the calibration curve. All results shall be reported at or above the MDL values; however, for those results falling between the MDL and the RL, a qualifier shall be applied to the results indicating the variability associated with the result. No results shall be reported below the MDL. Reporting limits for methods SW8290 and SW6010B/SW7471A for soil to be used for this project are listed in Table 3-4.

3.9.5.3 Instrument Calibration.

Analytical instruments shall be calibrated in accordance with the analytical methods. All analytes reported shall be present in the initial and continuing calibrations, and these calibrations shall meet the acceptance criteria. All results reported shall be within the calibration range. Results outside the calibration range are unsuitable for quantitative work and will only give an estimate of the true concentration. All calibration

Table 3-4. Reporting Limits and Method Detection Limits

Parameter	Method	Analyte	TEF	Soil (ng/kg)	
				RL	DL
Dioxins	SW8290	2,3,7,8-TCDD	1.0	1.0	0.1
		1,2,3,7,8-PeCDD	0.5	5.0	0.29
		1,2,3,4,7,8-HxCDD	0.1	5.0	0.61
		1,2,3,6,7,8-HxCDD	0.1	5.0	0.83
		1,2,3,7,8,9-HxCDD	0.1	5.0	0.48
		1,2,3,4,6,7,8-HpCDD	0.01	5.0	0.25
		OCDD	0.001	10	0.5
Furans		2,3,7,8-TCDF	0.1	1.0	0.13
		1,2,3,7,8-PeCDF	0.05	5.0	0.32
		2,3,4,7,8-PeCDF	0.5	5.0	0.39
		1,2,3,4,7,8-HxCDF	0.1	5.0	0.5
		1,2,3,6,7,8-HxCDF	0.1	5.0	0.63
		1,2,3,7,8,9-HxCDF	0.1	5.0	0.28
		2,3,4,6,7,8-HxCDF	0.1	5.0	0.74
		1,2,3,4,6,7,8-HpCDF	0.01	5.0	0.16
		1,2,3,4,7,8,9-HpCDF	0.01	5.0	0.35
		OCDF	0.001	10	0.5
California Metals	SW6010B			mg/kg	
		Antimony	N/A	1.0	0.22
		Arsenic	N/A	1.0	0.42
		Barium	N/A	1.0	0.1
		Beryllium	N/A	0.2	0.02
		Cadmium	N/A	0.2	0.04
		Total Chromium	N/A	0.5	0.05
		Cobalt	N/A	1.0	0.09
		Copper	N/A	1.0	0.28
		Lead	N/A	0.3	0.18
		Molybdenum	N/A	2.0	0.15
		Nickel	N/A	1.0	0.12
		Selenium	N/A	0.5	0.36
		Silver	N/A	0.5	0.1
		Thallium	N/A	1.0	0.3
		Vanadium	N/A	1.0	0.9
		Zinc	N/A	1.0	0.33
	SW7471A	Mercury	N/A	0.04	0.003

DL = detection limit
 HpCDD = heptachlorodibenzo-*p*-dioxin
 HpCDF = heptachlorodibenzofuran
 HxCDD = hexachlorodibenzo-*p*-dioxin
 HxCDF = hexachlorodibenzofuran
 mg/kg = milligrams per kilogram
 ng/kg = nanograms per kilogram
 OCDD = octachlorodibenzo-*p*-dioxin
 OCDF = octachlorodibenzofuran
 PeCDD = pentachlorodibenzo-*p*-dioxin
 PeCDF = pentachlorodibenzofuran
 RL = reporting limit
 TCDD = tetrachlorodibenzo-*p*-dioxin
 TCDF = tetrachlorodibenzofuran
 TEF = toxicity equivalency factor

criteria shall satisfy SW-846 requirements at a minimum. Additional information and instructions for instrument calibration can be found in the AFCEE QAPP (AFCEE, 2001)

3.9.6 Elements of Quality Control and Quality Control Procedures

3.9.6.1 Elements of Quality Control.

This section presents QC requirements relevant to environmental samples that shall be followed during all analytical activities for laboratories producing definitive data.

Laboratory QC samples (e.g., blanks, laboratory control samples [LCS]) shall be included in the preparation batch with the field samples. An AFCEE analytical batch is a number of samples (not to exceed 20 environmental samples plus the associated QC samples) that are similar in composition (matrix) and that are extracted or digested at the same time and with the same lot of reagents. MS/MSDs count as environmental samples. The term "AFCEE analytical batch" also extends to cover samples that do not need separate extraction or digestion (e.g., volatile analyses by purge and trap).

The type of QC samples and the frequency of use of these samples are discussed in the AFCEE QAPP (AFCEE, 2001) and the QAPP for Norton AFB (Earth Tech, 2001).

Control limits and spiking compounds for methods SW8290 and SW6010B/SW7471A used for soil and any water samples collected for this project are listed in Table 3-5. Surrogate control limits and spiking compounds for method 8290 are listed in Table 3-6.

3.9.6.2 Quality Control Procedures.

Quality control procedures, including holding time compliance, confirmation, and standard materials, are discussed in the AFCEE QAPP (AFCEE, 2001) and the QAPP for Norton AFB (Earth Tech, 2001).

3.9.7 Data Reduction, Validation, and Reporting

3.9.7.1 Data Reduction.

Laboratory data reduction and verification procedures are required to ensure that the overall objectives of analysis and reporting meet method and project specifications. Resultant data from chemical analyses will be checked for completeness and reasonableness. Accuracy will be continuously monitored by the laboratory. Earth Tech will place all data into spreadsheets or computerized databases for the purpose of data analysis and summarization. Earth Tech may also use the data to create logs, maps, or other appropriate tools for analysis of the data.

3.9.7.2 Data Validation.

Data validation will be accomplished by Earth Tech by reviewing the data provided by the laboratory and either accepting, rejecting, or qualifying it on the basis of established criteria. Validation criteria include holding times, instrument calibration, and QC results. Data will be validated according to the procedures and guidance given in the AFCEE QAPP (AFCEE, 2001) and the QAPP for Norton Air Force Base (Earth Tech, 2001).

Table 3-5. Control Limits for Laboratory Control Samples (Lcs)

Analytical	Method	Spiking Compounds	Final Spike Concentration (LCS)		Laboratory Established Control Limits	
			Water	Soil/Sediments	Water	Soil/Sediments
SW8290		2,3,7,8-TCDD	200 pg/L	20 ng/kg	60-140	60-140
		2,3,7,8-TCDF	200 pg/L	20 ng/kg	60-140	60-140
		1,2,3,7,8-PeCDD	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,7,8-PeCDF	1,000 pg/L	100 ng/kg	60-140	60-140
		2,3,4,7,8-PeCDF	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,4,7,8-HxCDD	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,6,7,8-HxCDD	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,7,8,9-HxCDD	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,4,7,8-HxCDF	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,6,7,8-HxCDF	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,7,8,9-HxCDF	1,000 pg/L	100 ng/kg	60-140	60-140
		2,3,4,6,7,8-HxCDF	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,4,6,7,8-HpCDD	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,4,6,7,8-HpCDF	1,000 pg/L	100 ng/kg	60-140	60-140
		1,2,3,4,7,8,9-HpCDF	1,000 pg/L	100 ng/kg	60-140	60-140
		OCDD	2,000 pg/L	200 ng/kg	60-140	60-140
		OCDF	2,000 pg/L	200 ng/kg	60-140	60-140
6010B		Antimony	0.5 mg/L	50 mg/kg	80-120	75-115
		Arsenic	2.0 mg/L	200 mg/kg	80-120	75-115
		Barium	2.0 mg/L	200 mg/kg	80-120	80-120
		Beryllium	0.05 mg/L	5.0 mg/kg	85-120	80-120
		Cadmium	0.05 mg/L	5.0 mg/kg	80-120	80-120
		Chromium	0.20 mg/L	20.0 mg/kg	85-120	85-120
		Cobalt	0.5 mg/L	50 mg/kg	80-120	80-120
		Copper	0.25 mg/L	25 mg/kg	80-120	80-120
		Lead	0.5 mg/L	50.0 mg/kg	80-120	80-120
		Molybdenum	1.0 mg/L	100 mg/kg	80-120	80-120
		Nickel	0.5 mg/L	50 mg/kg	80-120	80-120
		Selenium	2.0 mg/L	200 mg/kg	80-120	70-115
		Silver	0.05 mg/L	5.0 mg/kg	80-120	80-120
		Thallium	2.0 mg/L	200 mg/kg	75-125	75-125
		Vanadium	0.5 mg/L	50 mg/kg	85-120	80-120
		Zinc	0.5 mg/L	50 mg/kg	85-120	80-120
7470A/7471A		Mercury	0.005 mg/L	0.833 mg/kg	80-120	85-115 ²

² = Acceptance limits for MS/MSD are 80-120

HpCDD = heptachlorodibenzo-*p*-dioxin

HpCDF = heptachlorodibenzofuran

HxCDD = hexachlorodibenzo-*p*-dioxin

HxCDF = hexachlorodibenzofuran

mg/kg = milligrams per kilogram

mg/L = milligram per liter

mg/L = milligrams per liter

ng/kg = nanogram per kilogram

ng/kg = nanograms per kilogram

ng/L = nanogram per liter

OCDD = octachlorodibenzo-*p*-dioxin

OCDF = octachlorodibenzofuran

PeCDD = pentachlorodibenzo-*p*-dioxin

PeCDF = pentachlorodibenzofuran

pg/L = picogram per liter

pg/L = picograms per liter

TCDD = tetrachlorodibenzo-*p*-dioxin

TCDF = tetrachlorodibenzofuran

TEF = toxicity equivalency factor

Table 3-6. Laboratory Control Limits for Surrogate Spikes

Analytical Method	Final Spike Concentration		Laboratory Control Limits Percent Recovery (%)	
	Anticipated Spiking Compounds (Surrogates)	Water (pg/L)	Soil/ Sediments (ng/kg)	Water Soil/ Sediments
8290	C ₁₂ 2,3,7,8-TCDD	2000	200	40-135
	C ₁₂ 2,3,7,8-TCDF	2000	200	40-135
	C ₁₂ 1,2,3,7,8-PeCDD	2000	200	40-135
	C ₁₂ 1,2,3,7,8-PeCDF	2000	200	40-135
	C ₁₂ 1,2,3,6,7,8-HxCDD	2000	200	40-135
	C ₁₂ 1,2,3,4,7,8-HxCDF	2000	200	40-135
	C ₁₂ 1,2,3,4,6,7,8-HpCDD	2000	200	40-135
	C ₁₂ 1,2,3,4,6,7,8-HxCDF	2000	200	40-135
	C ₁₂ OCDD	4000	400	40-135

HpCDD = heptachlorodibenzo-*p*-dioxin

HpCDF = heptachlorodibenzofuran

HxCDD = hexachlorodibenzo-*p*-dioxin

HxCDF = hexachlorodibenzofuran

mg/kg = milligrams per kilogram

mg/L = milligrams per liter

ng/kg = nanograms per kilogram

ng/L = nanograms per liter

OCDD = octachlorodibenzo-*p*-dioxin

OCDF = octachlorodibenzofuran

PeCDD = pentachlorodibenzo-*p*-dioxin

PeCDF = pentachlorodibenzofuran

pg/L = picograms per liter

pg/L = picograms per liter

TCDD = tetrachlorodibenzo-*p*-dioxin

TCDF = tetrachlorodibenzofuran

3.9.7.3 Data Reporting.

Data reporting by the laboratory will include results from both initial and continuing calibration, blanks, duplicates, MS/MSDs, and other data where applicable. Backup data such as chromatograms will be presented with the data when requested, usually for 10 percent of the data. A careful review of the data reports and associated data will be made by the QA officer.

Earth Tech will report final validated data in the form of an addendum to the closure certification document.

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Appendix A

Health and Safety Management Plan

Health and Safety Management Plan

Removal Action and Soil Sampling IRP Sites 10 and 12 Former Norton Air Force Base, CA

Prepared for:

United States Air Force Headquarters
Air Force Real Property Agency and
Air Force Center for Environmental Excellence (AFCEE)
Brooks City-Base, TX 78235

Prepared by:

Earth Tech, Inc.
Health and Safety Department
100 West Broadway, Suite 240
Long Beach, California 90802

August 2003

Approval
for
Health and Safety Management Plan
Removal Action and Soil Sampling

By signing below, I acknowledge that I have reviewed and hereby approve the Health and Safety Management Plan (HSMP) for activities associated with the non-time critical removal action of dioxin and metals contaminated soil at the Installation Restoration Program (IRP) Sites 10 and 12 at the former Norton Air Force Base, California. The HSMP documents the overall health and safety management program requirements for the removal/disposal and sampling activities, including assignment of the health and safety duties and responsibilities of each organization performing on site activities and establishment of minimum on site health and safety performance standards. The requirements of this document will pertain to all on-site activities and organizations associated with the Removal Action and Soil Sampling at Norton Air Force Base, California.

REVIEWED AND APPROVED BY:

Alain Sharp
Project Manager

Date

Rose Siengsubcharti, M S.
Environment, Health and Safety Professional

Date

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1.0 INTRODUCTION

Earth Tech will provide field oversight for Apex Environmental, Formost Construction, CalVada Surveyors, and Terra Physics in the excavation of dioxin contaminated soil (Site 10) and excavation of metals contaminated soil (Site 12) located at the former Norton Air Force Base (AFB), California. The intent of the work activities will be to remove contaminated soil at concentrations that pose a risk to human health, properly transport the soil to an approved disposal facility, replace removed soil with clean backfill material, and restore the site. Subcontractors are expected to function as independent groups and Earth Tech will not provide any operational direction. Earth Tech will perform soil sampling and submit samples to an approved laboratory for chemical contaminants assessment. In addition, Earth Tech will perform soil sampling if further excavation of contaminated soil is recommended.

1.1 STATEMENT OF PURPOSE

The purpose of this Health and Safety Management Plan (HSMP) is to establish the overall site health and safety program to be implemented during the removal action and soil sampling activities scheduled for IRP Sites 10 and 12. The HSMP specifies:

- Overall site health and safety management procedures
- Duties and responsibilities of each on site team member with respect to operational health and safety.
- Minimum health and safety performance requirements to be implemented for each work task.
- Non-task specific health and safety performance requirements.
- Personnel requirements.
- Site emergency response procedures.

Subcontractors must prepare their own health and safety plan (HASP) to address the task-specific procedures they will perform. At minimum, the HASP must conform to all requirements specified in this HSMP and must be approved by the Earth Tech Environmental, Health and Safety (EH&S) Department

The Earth Tech assigned Health and Safety Professional (H&SP) will approve the HSMP. No changes may be made to the HSMP without the approval of the H&SP

1.2 CLASSIFICATION OF ACTIVITIES

The planned work activities are classified as Hazardous Waste Operations and Emergency Response (HAZWOPER) activities in accordance with 8 CCR §5192. Section 2.0 provides a description of the site and the overall work activities to be performed. Specific work task descriptions and hazard analyses are provided in the individual organizational HASPs.

1.3 REFERENCES

This HSMP meets the requirements and follows the guidelines established by the Federal regulatory agencies in the following documents:

- Title 8 of the California Code of Regulations (8 CCR), General Industry Safety Orders
- Title 8 of the California Code of Regulations (8 CCR), Construction Safety Orders

- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute of Occupational Safety and Health NIOSH 85-115, 1985.

The requirements specified in this HSMP also conform to Earth Tech's Corporate EH&S Program requirements.

2.0 PROJECT BACKGROUND AND DESCRIPTION

2.1 FACILITY BACKGROUND

Norton AFB is located near the east end of the San Bernardino Valley in San Bernardino County, California. The base is approximately 65 miles east of Los Angeles, 50 miles west of Palm Springs, and 5 miles north of the San Bernardino-Riverside county line.

2.1.1 Site information/Past sampling activities

Sites 10 and 12 are located in the south-central portion of the base in an area developed into a golf course. Site 10 was a former landfill used to dispose general refuse. Site 12 was used as a waste pit containing chemical and construction debris wastes, with reported incineration of the wastes within the pit itself.

Dioxin and heavy metal compounds were detected at levels near and exceeding preliminary remediation goals (PRGs) in soil samples.

2.2 SCOPE OF WORK

The scope of work presents activities necessary for removal of dioxin contaminated soil (Site 10) and metals contaminated soil (Site 12). Task specific activities performed by subcontractors will include:

- Geophysical clearance
- Surveying
- Soil excavation (Sites 10 and 12)
- Backfill
- Restoration of excavated areas

Task specific procedures for subcontractors will not be discussed here, as they will be included in their respective health and safety plan (HASP).

Task-specific procedures for Earth Tech will include and are further described on the next page:

- Confirmation soil sampling (Sites 10 and 12)
- Waste management

Confirmation soil sampling

Confirmation soil sampling at Site 10 will be performed following excavation of contaminated soil. Earth Tech personnel will enter the excavation to collect soil along the bottom and sidewalls of the excavation. Samples will be collected using a sterilized, pre-packaged plastic disposable trowel inserted into the soil at the base of the excavation. The soil will be recovered and placed into one or more glass jars, labeled, and placed in an ice-filled cooler for shipment. The depth of the excavation upon entry will be approximately 2 feet in depth. Earth Tech personnel will be required to follow excavation entry guidelines found in Earth Tech Environmental Practice Standard ENV 515, *Excavation* (Attachment C) should the depth of the excavation reach 5 feet in depth.

Waste management

Earth Tech will take part in segregating wastes by removing concrete and soil from holding bins for proper disposal. Concrete, soil, and liquid wastes will be characterized per CCR 22 by collecting a composite sample.

from the 55-gallon drums. Liquid wastes will be transported offsite to an approved and licensed waste handling or treatment facility

The project Work Plan and the individual organizational/team member HASPs will provide greater detail concerning specific tasks associated with each work activities listed in this section.

3.0 HEALTH AND SAFETY MANAGEMENT STRUCTURE, DUTIES AND RESPONSIBILITIES

3.1 ORGANIZATIONAL RESPONSIBILITIES

Each of the organizations in the Earth Tech team (ET and subcontractors) is responsible for assigning specific work tasks to their employees. Each organization's management will provide qualified employees and allocate sufficient time, materials and equipment to safely complete assigned tasks. Attachment B provides Earth Tech's general subcontractor safety rules, which will be observed by all on-site organizations.

Each team member is experienced in the work operations for which they are tasked to provide, and each organization is responsible for compliance with all regulatory requirements pertaining to those services. Each team member is required to perform its operations in accordance with its own safety policies and procedures, to prepare a HSMP or HASP for its work activities (which reflects the unique safety hazards associated with its work and the requirements specified in this HSMP) to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for an organization's work activities will be provided to Earth Tech for review prior to the start of on-site activities. In the event that team member procedures/requirements conflict with requirements specified in this HSMP, the more stringent guidance will be adopted.

Hazards known to be associated with a team member's services must be identified and addressed to the Earth Tech Project Manager (PM) or Site Manager (SM) prior to beginning work operations. The SM or authorized representative has the authority to halt any on site work operation, and to remove any employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

Each of the major organizations in the Earth Tech team (ET and subcontractors) is assigned specified duties and responsibilities for conduct of these work activities, which may be found in Section 2.2 or the project Work Plan.

3.2 SAFETY MANAGEMENT STRUCTURE/PERSONNEL DUTIES AND RESPONSIBILITIES

Each person is responsible for his/her own health and safety, for completing tasks in a safe manner, and for reporting any unsafe acts or conditions to the Project Manager. All personnel are responsible for continuous adherence to these health and safety procedures during the performance of their work. No person may work in a manner, which conflicts with the latter or the intent of safety and environmental precautions expressed in these procedures.

Each of the two organizations in the Earth Tech team will exercise specific on-site responsibilities with respect to management of health and safety. During this work, the following duties and responsibilities are assigned to project personnel.

3.2.1 Project Manager (Mr. Alain Sharp)

The Project Manager (PM) has overall management authority for ensuring that all project activities are completed in accordance with requirements set forth in this plan. The PM will confer with the designated Health and Safety Professional on all matters affecting health and safety. Other health and safety related duties of the PM include:

- 1 Reading and becoming familiar with this HSMP and all organizational HASPs
- 2 Ensuring that personnel assigned to field activities meet appropriate health and safety qualifications and possess sufficient experience and knowledge to safely perform required duties.
- 3 Providing day-to-day management of site work activities.

The PM will assign a point-of-contact personnel, most likely an SM or SSO personnel.

3.2.2 Health and Safety Professional (Ms. Rose Siengsubcharti)

The designated Health and Safety Professional (H&SP) is the member of the Earth Tech Health and Safety Department responsible for overseeing all aspects of the site safety program, and preparing any site-specific safety guidance documents or addenda to this plan. The designated H&SP does not report to the PM, and is separately accountable to Earth Tech senior management for site health and safety. The H&SP's other responsibilities include:

1. Preparing the HSMP.
2. General health and safety program administration.
3. Determination of task-specific health and safety requirements based upon applicable task hazard analyses
4. Conducting project health and safety audits as warranted.
5. Updating equipment or procedures based on information obtained during site operations.
6. Reviewing subcontractors HASPs.

The PM and SM will be responsible to the H&SP for project health and safety. The Site Safety Officer will take technical direction from the H&SP.

3.2.3 Site Manager (Mr. Thomas Funk)

The Site Manager (SM) will be the senior project management official on the work site, and will provide operational management of work activities. The SM is also responsible for ensuring the implementation of all H&S requirements, including communicating site requirements to all personnel, observing that field supervisors and subcontractors enforce all provisions of the HSMP, applicable organizational HASP requirements, and other H&S documentation. The SM will work with the Site Safety Officer to implement all H&S performance elements, and consulting with the H&SP regarding any necessary changes to H&S requirements. Other responsibilities include:

- Reading and becoming familiar with this HSMP and applicable HASPs;
- Enforcing the all applicable safety requirements and procedures;
- Ensuring that no work is performed which is not properly addressed in the HSMP and applicable HASPs;
- Maintaining the presence of at least one qualified first aid provider on-site at all times; and
- Contacting the H&SP for guidance regarding any health and safety related matters.

Qualifications: The SM is required to be HAZWOPER qualified and to have completed an 8-hour HAZWOPER Supervisor Training Course in accordance with 8 CCR§5192 (e)(4).

3.2.4 Site Safety Officer (Ms. Paula Delong)

The SSO is responsible for on-site management and implementation of all safety and health procedures. The duties of the SSO include:

- Conducting periodic safety reviews of the project site and project documentation;

- Performing regular and frequent site inspections to identify hazards and observe employees at work;
- Stopping work, as required, to maintain personal and environmental health and safety;
- Determining emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation;
- Ensuring that all site personnel and visitors have received the proper training and medical clearance prior to entering the site;
- Establishing any necessary controlled work areas (as designated in this HSMP or other H&S documentation);
- Presenting tailgate safety meetings; maintaining tailgate meeting attendance logs and records;
- Discussing potential health and safety hazards with the SM, HSSE Manager and the PM; and
- Maintaining decontamination procedures that meet established criteria

Qualifications: The SSO is required to be HAZWOPER qualified and to have completed an 8-hour HAZWOPER Supervisor Training Course in accordance with 8 CCR§5192 (e)(4).

3.2.5 Subcontractors (Apex Environmental, Formost Construction, CalVada Surveyors, and Terra Physics)

Each Earth Tech subcontractor is responsible for assigning specific work tasks to its employees, and for ensuring that their personnel are properly trained and participate in health and safety programs, which fulfill the requirements specified in this HSMP (e.g., hearing conservation). Each subcontractor's management will provide qualified employees and allocate sufficient time, materials and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personal protective equipment.

Earth Tech considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked, and each subcontractor is responsible for compliance with those regulatory requirements, which pertain to those services. Each subcontractor is expected to manage and perform work activities outlined in Section 2.2. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any safety documentation required for each subcontractor's work activities will be provided to Earth Tech for review prior to the start of on-site activities. In the event that each subcontractor's procedures/requirements conflict with requirements specified in this HSMP, the more stringent guidance will be adopted.

The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

Attachment B provides Earth Tech's general subcontractor safety rules, which will be observed by all subcontractor organizations.

3.3 ONSITE PERSONNEL AND VISITORS

Each person (Earth Tech or subcontractor employee) is responsible for his/her own health and safety, for completing assigned tasks in a safe manner, and for reporting any unsafe acts or conditions to his/her supervisor. All personnel are responsible for continuous adherence to the specified health and safety procedures during the performance of their work. No person may work in a manner, that conflicts with the letter or intent of safety and environmental precautions expressed in these procedures. After due warnings, Earth Tech will dismiss from the work site any person who violates safety procedures. Earth Tech employees are subject to progressive discipline and may be terminated for blatant or continued violations.

All personnel working for Earth Tech and its subcontractors are required to read and acknowledge their understanding of the HSMP and any other applicable H&S documentation. All visitors to controlled work areas of any project site must likewise read and acknowledge their understanding of the applicable H&S requirements. All personnel are expected to abide by all written H&S requirements and any supplementary instructions, and cooperate with supervisory personnel to ensure a safe and healthful work site. Site personnel are required to report immediately any of the following to the SM or SSO:

- Accidents and injuries (major or minor)
- Unexpected or uncontrolled releases of any hazardous substances
- Any symptoms of exposure to a hazardous substance
- Any unsafe or malfunctioning equipment
- Any changes in site conditions, which may affect the health or safety of project personnel.

4.0 PROGRAMMATIC HEALTH AND SAFETY PROCEDURES

The following health and safety procedures apply to all work activities to be conducted at IRP Sites 10 and 12 at Norton AFB.

4.1 HAZWOPER REQUIREMENTS

All Earth Tech and subcontractor personnel performing work activities for this project must be qualified as HAZWOPER workers, and must meet the training and medical monitoring requirements specified in Section 1.0 of Earth Tech Environmental Practice Standard ENV 301, *Hazardous Waste Operations* (see Attachment C)

4.2 ON-SITE TRAINING PROCEDURES

In accordance with the requirements of Earth Tech Environmental Practice Standard ENV 202, *Safety Meetings* (see Attachment C), the following safety training will be conducted as part of field operations:

Initial Orientation Training – As operations are initiated on site personnel will be trained about potential hazards at the work site, and the requirements specified in this HSMP for hazard prevention.

Tailgate Safety Briefings – The SSO will conduct a tailgate safety briefing at the start of each work day.

Hazard Communication Training – The requirements for on-site management of hazardous materials is specified in Earth Tech Environmental Practice Standard ENV 207, *Hazard Communication Program* (see Attachment C). All personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all material safety data sheets (MSDSs).

All site-specific training should be documented on the *Tailgate Safety Briefing Sign-in Log*, a copy that is found in ENV 202

4.3 GENERAL SITE SAFETY RULES

The following Earth Tech Environmental Practice Standards are generally applicable to all work operations to be conducted on site, and must be followed by all personnel present on site:

ENV 201 – *General Safety Rules*

ENV 205 – *Personal Protective Equipment*

ENV 501 – *Manual Materials Handling*

ENV 507 – *Handling of Drums and Large Containers*

ENV 528 – *Heat Stress and Hot Weather Operations*

Copies of these procedures may be found in Attachment C

4.3.1 Smoking, Eating, and Drinking

Smoking, eating and drinking will not be permitted within any controlled work area. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any Earth Tech site.

4.3.2 Housekeeping

During site activities work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal.

4.3.3 Personal Hygiene

The following requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

- **Potable Water** - An adequate supply of potable water will be available for field personnel consumption and use in cleaning activities. Potable water used for drinking can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual use cups will be provided as well as adequate disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.
- **Non-Potable Water** - Non-potable water cannot be used for drinking or washing purposes, but may be used for non-hygiene-related activities. All containers of non-potable water will be marked with a label stating:

Non-Potable Water

Not Intended for Drinking Water Consumption

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. Personnel will be required to clean hands and face using water and hand soap (or similar substance) when exiting from the work area, prior to breaks, and at the end of daily work activities.

4.3.4 Buddy System

All field personnel shall use the buddy system when working within any controlled work area. Personnel belonging to another organization onsite can serve as "buddies" for Earth Tech personnel. Under no circumstances shall an Earth Tech employee be present alone in a controlled work area.

4.4 SITE CONTROL

Because remedial operations have the potential to be a source of physical and chemical exposures, it will be necessary to establish controlled work areas, where entry is granted to trained personnel equipped with adequate exposure mitigation and monitoring equipment.

The excavation sites within IRP Sites 10 and 12 will function as a single controlled work area. All members of the Earth Tech team will designate a single entry/exit location for use, and building/areas access ways will be physically sealed to prevent accidental entry if work will be conducted near buildings. Thus, all common ventilation system connections will also be sealed, to prevent migration into uncontrolled areas of contaminants produced during remediation. A decontamination station should be established at the controlled area entrance to allow personnel to clean up prior to leaving the area.

Within the controlled work area, specific locations may be designated for additional control due to hazards associated with on-going work, such as contact with contaminated soil or water and the excavation itself. The desired means for controlling these areas is through the use of physical/visible barriers (e.g., yellow CAUTION tape or construction of chain-linked fences) can be used to identify the extent of any controlled area. The

locations of controlled areas should be briefed to personnel during the daily tailgate safety meeting, and personnel should understand that entry into these areas is forbidden except for performance of assigned work activities. Personnel can implement special decontamination procedures for use when exiting any controlled area, as determined by the SM or SSO

4.5 INJURY REPORTING

Requirements for reporting and documentations of injuries and accidents can be found in Earth Tech Environmental Practice Standard ENV 106, *Injury, Illness and Near-Miss Reporting*.



5.0 ANALYSIS OF FACILITY CONTAMINANT HAZARDS

For this project, Earth Tech will perform confirmation soil sampling. Performance of these tasks can expose personnel to a variety of hazards due to the operational activities, physical conditions of the work locations, and the potential presence of environmental contaminants.

5.1 SPECIFICATION OF WORK TASKS

The following is a listing of the work tasks to be performed during work and assessment activities. A Task Hazard Analysis (THA) has been prepared for each task, which specifies the major performance steps, identifies the related hazards and applicable safety procedures, and specifies any additional requirements (e.g., monitoring procedures). All THAs can be found in Attachment A.

1. Confirmation Soil Sampling
2. Hand Augering
3. IDW Management

5.1.1 Unanticipated Work Activities

Where work activities are identified which are not addressed in this HSMP, appropriate safety documentation and procedures will be implemented. Prior to initiation of work activities any subcontractor organization tasked with performance of such work will submit a work procedure document, which presents appropriate safety procedures applicable to the specific work activities to be undertaken. Submitted safety procedures will be reviewed by the H&SP for adequacy and compliance with applicable regulatory requirements and the requirements presented in this HSMP. Work will not be initiated until this review is completed and any identified deficiencies corrected to the satisfaction of the H&SP.

The H&SP may issue an exemption to this requirement based on the nature of the work activities to be undertaken.

5.2 IDENTIFICATION OF HAZARDS

Performance of the above work activities presents the following hazards to personnel:

Chemical Exposure: Soil samples may contain concentrations of dioxin and heavy metals. While collecting soil within the excavation, personnel may be exposed via skin contact. Protection will be provided through the use of PPE. Direct-reading monitoring procedures will not be required as the soil confirmation portion of the project will not produce significant airborne dust concentrations.

Open Excavations: The presence of open excavation creates potential slip/fall hazards to workers. Entry of any excavation can present an engulfment hazard, and requires that proper excavation sloping or shoring be employed. Open excavations/pits will never be left unattended, and all entries and exits will be accomplished using portable ladders.

Materials Handling: The handling of materials related to this site may introduce harm to individuals. Protection will be provided through the use of PPE and manual lifting guidelines.

5.3 CHEMICAL CONTAMINANTS

Past site activities have suggested the potential presence of two (2) types of facility contaminants, any of which may be encountered during this project:

- Dioxin
- Heavy metals

5.3.1 Dioxin

Dioxins can be formed during the combustion of PCBs. In early landfilling practices, circa 1950, it was not uncommon to burn wastes to reduce volume, and if PCBs were present during this combustion then dioxins may have been formed.

"Dioxins" is a general term applied to a family of 75 chlorinated dibenzo-p-dioxin compounds. At the present time, little data is available concerning the hazards associated with many members of this group; however, at least one compound, 2,3,7,8-tetrachlorobenzo-p-dioxin (TCDD), has been identified as a potential carcinogen. Dioxin compounds exhibit a relatively low vapor pressure, and present little potential for significant airborne exposure during site investigations, however skin contact should be prevented through the use of chemically protective clothing when handling contaminated materials. At the present time, neither OSHA nor ACGIH has established exposure standards to any members of the dioxin group. Of the dioxin compounds, TCDD is considered to be the most toxic due to its carcinogenic potential. Earth Tech has adopted an Occupational Exposure Limit (OEL) for total dioxins of 65 picograms per cubic meter TCDD-equivalent airborne concentration during intrusive activities where a significant amount of dust may be generated.

Dioxin compounds present exposure hazards via inhalation, skin contact and ingestion. Since dioxins possess extremely low vapor pressures, inhalation exposure results from respiration of particulate matter to which dioxins are attached (e.g., contaminated soil particles). The use of dust suppression techniques (as appropriate) and the proper use of the specified respiratory protection will adequately protect personnel. Skin contact/dermal absorption can be prevented through the use of chemically protective gloves, Tyvek suits and similar protective clothing. Ingestion results largely from hand-to-mouth contact, and can be prevented through the use of proper decontamination procedures when existing from dioxin-contaminated areas.

5.3.2 Heavy Metals

As a group, the heavy metals (including lead, arsenic, chromium, nickel, and selenium) are toxic to a number of organs and organ systems in the body including the liver, kidneys, blood-forming organs (primarily located in the bones), and the CNS (especially lead). Acute exposure to metals can produce symptoms such as stomach distress and vomiting, mental confusion and sluggishness, heart palpitations, breathing difficulties, and renal (kidney) failure. Chronic exposures can be characterized by deterioration in function of the liver and kidneys, CNS degradation, and abnormal changes in blood cell counts (especially white blood cells). Exposure to chromium may also lead to formation of lung and gastric cancers.

The primary route of exposure to heavy metals of concern during this project is contact with contaminated soils and water, which can lead to entry through open wounds or contamination and ingestion of food. Preventing this route of exposure necessitates the use of dust control measures and appropriate protective clothing and decontamination procedures.

5.4 ASSESSMENT OF HAZARDS

There is the potential for occupational exposure to occur through one direct route (skin contact) and one indirect route (ingestion). Descriptions of exposure hazards and protective measures can be found in Section 5.3.

Inhalation

Release of contaminants during excavation is not likely to pose an inhalation hazard due to the physical properties of dioxin and heavy metals. Dust suppression techniques will be employed throughout the excavation to keep concentrations to a minimum. Due to the nature of work involved, air monitoring during confirmation soil sampling is not required.

Skin Contact

Contact with contaminated materials is likely during collection/handling of environmental samples. However, protection against skin contact/absorption can be accomplished through the use of protective gloves/clothing (see Section 6.3).

Ingestion

Contact with contaminated materials is likely during collection/handling of environmental samples. However, protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas (see Section 6.4).

6.0 OPERATIONAL HEALTH AND SAFETY REQUIREMENTS

The following Earth Tech Environmental Practice Standards are applicable to specific work tasks, as specified in the IHAs in Attachment A, and must be followed at all times while performing the specific task:

ENV 515 – *Excavation*

A copy of this procedure may be found in Attachment C.

6.1 SLIPS, TRIPS, FALLS, AND PROTRUDING OBJECTS

Hazards from protruding objects, careless movements, or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to ensure the prevention of such injuries.

6.2 HAZARDOUS NOISE ENVIRONMENTS

Working around large equipment often creates excessive noise. The effects of noise can include physical damage to the ear, pain, and temporary and/or permanent hearing loss. Workers can also be startled, annoyed, or distracted by noise during critical activities.

Earth Tech has compiled noise-monitoring data, which indicates that work locations within 25 feet of operating heavy equipment (drill rigs, earthworking equipment, etc.) can result in exposure to hazardous levels of noise (levels greater than 90 dBA). Accordingly, all personnel are required to use hearing protection (ear plugs or ear muffs) within 25 feet to any operating piece of heavy equipment.

The H&SP may also monitor employee exposure to hazardous noise levels as part of Earth Tech's Hearing Conservation Program.

6.3 PERSONAL PROTECTIVE EQUIPMENT REQUIREMENTS

General requirements for the use of personal protective equipment by Earth Tech and subcontractor personnel may be found in Earth Tech Environmental Practice Standard ENV 205, *Personal Protective Equipment*. Requirements for HAZWOPER-specific protective equipment ensembles are found in Section 3.0 of Earth Tech Environmental Practice Standard ENV 301, *Hazardous Waste Operations*. Copies of both procedures may be found in Attachment C.

In addition, specific personal protective equipment requirements are specified on a task-specific basis in the individual IHAs found in Attachment A.

6.4 DECONTAMINATION ACTIVITIES

All requirements for performing personal and equipment decontamination may be found in Earth Tech Environmental Practice Standard ENV 535, *Decontamination* (see Attachment C).

7.0 EMERGENCY CONTINGENCY PLAN

The planned work activities present no significant potential for a catastrophic accident to occur. However, the following information is provided for use in the event of an emergency:

7.1 GENERAL

Two major categories of emergencies could occur during site operations:

1. Illnesses and physical injuries (including injury-causing chemical exposure).
2. Catastrophic events (fire, explosion, earthquake, or chemical).

Although a catastrophic event or severe medical emergency is unlikely, an emergency contingency plan has been prepared for this project, should such critical situations arise.

7.2 RESPONSIBILITIES

7.2.1 Other Onsite Personnel

Field personnel are required to inform the SM or SSO of all emergency situations and to abide by their issued response actions. Special medical problems of field personnel, such as allergies to insects, plants, or prescription medication, will be reported to the SM or SSO.

7.3 EMERGENCY EQUIPMENT

The following emergency equipment specified in the following sections will be available and in proper working condition.

7.3.1 First aid Kits

Each work site will have a first aid kit that meets the following requirements:

- First aid kits will be in weatherproof containers, be approved by the Earth Tech Occupational Physician, meet all regulatory requirements, and be present at all locations where Earth Tech employees are working.
- Whenever a new first aid kit is assembled, a new Inventory List and Physician's Authorization Certificate will be placed in the first aid kit as part of its inventory.
- First aid kits will be available at the job site at all times.
- Personnel permitted to use first aid kits will possess a current first aid card. A minimum of two trained first aid/CPR providers will be present on site at all times.

7.3.2 Eyewash Units

An eyewash unit meeting the latest requirements of American National Standards Institute (ANSI) Standard Z358.1 will be maintained at the flare station. All units will be capable of supplying hands-free irrigation for both eyes for at least 15 minutes at a flow rate of at least 0.4-gallon per minute.

7.3.3 Fire Extinguisher

A fire extinguisher with a minimum rating of 10A:40B:C will be available for use at each work location at all times. Site personnel will be trained in the use of the available fire extinguisher type(s), and will be kept aware of all on-site locations of where extinguisher are placed (for access in case of fire).

7.4 RESPONSE ACTIONS—MEDICAL EMERGENCIES

A medical emergency is a situation that presents a significant threat to the health of personnel onsite. Chemical exposure, heat stress, cold stress, and poisonous insect bites can cause medical emergencies. Proper care must be initiated immediately. Proper care may be in the form of first aid treatment or emergency hospitalization.

Response personnel will accompany victims to the medical facility, whenever possible, to advise on decontamination. Table 7-1 provides instructions to respond to general categories of medical emergencies.

Table 7-1. Emergency Response Actions

Emergency	Response
Inhalation	<p>Call for medical assistance</p> <p>Workers wearing proper respiratory protective equipment should remove the victim from the contaminated atmosphere</p> <p>Voluntary basis only: If the victim is not breathing, administer mouth-to-mouth resuscitation or CPR immediately</p>
Eye Contact	<p>Do not rub eyes.</p> <p>Flood eyes with emergency eyewash solution. Hold the eye open and flood so that all surfaces are thoroughly washed.</p> <p>Continue washing for 15 minutes while calling for medical assistance</p>
Skin Exposure	<p>Wash skin with soap and water for a minimum of 15 minutes. All contaminated areas on the body, including hair, should be thoroughly decontaminated</p> <p>If clothing is contaminated, it should be removed in a way to minimize further contact with the substance.</p> <p>Seek medical assistance</p>
Burns (thermal)	<p>Stop the burning. Remove the victim from the heat source. Cool the burn with cold water. Check breathing. Stop bleeding (if any). Cover the burn with a sterile pad or clean sheet. Maintain body temperature and take victim to the nearest medical facility</p> <p>Note: Do not apply oils, sprays or ointments to a serious burn</p> <p>Sunburn may also be cooled with water. If the sunburn is severe or is very extensive, seek medical attention</p>

7.4.1 Medical Assistance

The SM or SSO will keep on site the list of emergency telephone numbers and locations of the local fire department, hospitals, ambulance service, and other emergency services (see Table 7-2).

The SM or SSO will inform hospital personnel of non-emergency medical treatment administered to personnel for onsite injury, illness, or exposure to chemical contaminants.

7.4.2 Treatment in Case of Electrical Shock

Notify the nearest medical treatment facility in all cases involving injury from electrical shock. The employee may not resume work until cleared by the H&SP after consultation with Earth Tech's occupational physician.

7.5 RESPONSE ACTIONS—CATASTROPHIC EVENTS

In the event of a catastrophic incident:

1. Stop all work activities and evacuate all project personnel from the work location. Evacuate personnel in a direction opposite the critically affected area. Have personnel assemble in a pre-designated location outside of the job site.
2. Take a head count of the assembled employees. Administer first aid to any injured individuals.
3. Contact the SM or SSO immediately, if the SM or SSO is not currently present at the work location.

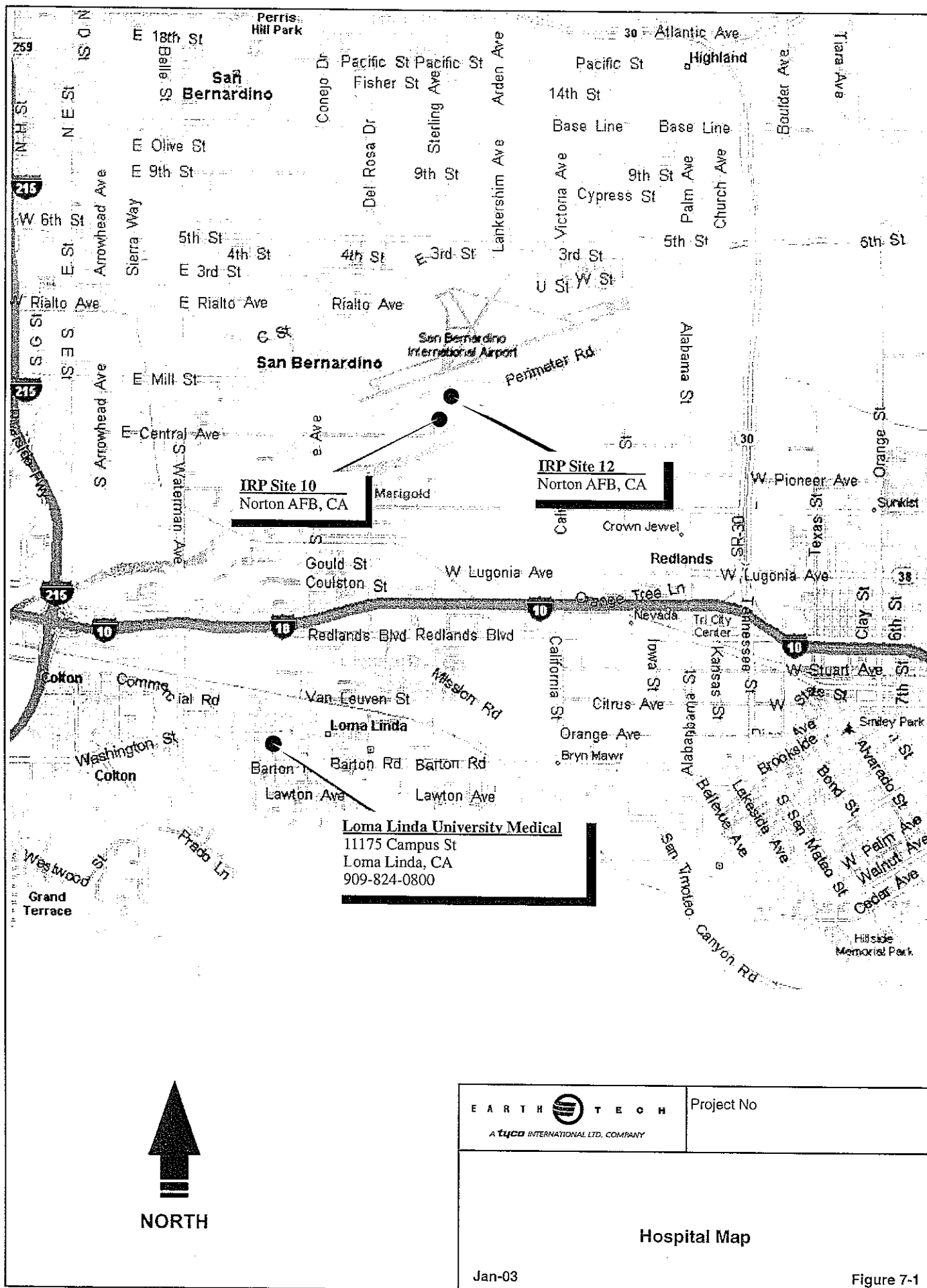
The SM or SSO will designate (1) a universal signal for emergency evacuation (e.g., use of a horn) and (2) the evacuation assembly location. The SM or SSO will communicate these designations to all field personnel during the initial site-specific training. The SM or SSO will determine any changes in these designations mandated by changing site conditions, and will communicate these changes to workers during the daily tailgate safety briefing.

Table 7-2. Emergency Contact Numbers

Fire Department	911
Medical Care	911/(909) 796-0167
Loma Linda Medical Ctr.	
11234 Anderson St	
Loma Linda, CA	
909-796-0167	
Police	911
Poison Control Center (regional)	(800) 222-1222
Information and Response Organizations	
National Poison Control Center	(800) 458-5842
EPA Environmental Response Team (ERT)	(201) 321-6660
Resource Conservation and Recovery Act (RCRA) Hotline	(800) 424-9346
Earth Tech Personnel	
Health and Safety Professional	
Rose Siengsubcharti	(562) 951-2314
	Mobile:(562) 537-2227
Project Manager	
Alain Sharp	(909) 554-5053
Site Manager/Site Safety Officer	
Thomas Funk	(909) 554-5027
Paula Delong	(909) 554-5022

Hospital Facilities

Loma Linda Medical Ctr.
11234 Anderson St
Loma Linda, CA
909-796-0167



Attachment A

Earth Tech Task Hazard Analyses

Evaluated by: Rose Siengubcharti, M.S.

Date: June 2003

TASK NAME

CONFIRMATION SOIL SAMPLING

TASK DESCRIPTION	CHEMICAL EXPOSURE HAZARDS
Confirmation soil sampling at Site 10 will be performed following excavation of contaminated soil. Earth Tech personnel will enter the excavation to collect soil along the bottom and sidewalls of the excavation. Samples will be collected using a sterilized, pre-packaged plastic disposable trowel inserted into the soil at the base of the excavation. The soil will be recovered and placed into one or more glass jars, labeled, and placed in an ice-filled cooler for shipment. The depth of the excavation upon entry will be approximately 2 feet in depth. Earth Tech personnel will be required to follow excavation entry guidelines found in Earth Tech Environmental Practice Standard ENV 515, Excavation (Attachment C) should the depth of the excavation reach 5 feet in depth.	<ul style="list-style-type: none"> • Dioxin (dermal) • Heavy metals (dermal)

PPE	OTHER SAFETY EQUIPMENT	PHYSICAL HAZARDS
Level D PPE (ENV 301) <ul style="list-style-type: none"> • Hard hat • Short-sleeved shirt (tank tops are not acceptable) • Long pants (shorts or cut-offs are not acceptable) • Safety-toed work boots • Safety glasses • Hearing protection (as required) <p>Note: Personnel must wear chemically protective inner (Best Safety n-Dex) and outer (Ansell-Edmont Sol-Vex) gloves when handling soil samples.</p>	None	<ul style="list-style-type: none"> • Slips, trips, falls, and protruding objects • Heat stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES	ADDITIONAL SAFETY CONSIDERATIONS
<ul style="list-style-type: none"> • Slips, Trips, Falls, and Protruding Objects (Section 6.1) • Heat Stress Prevention (ENV 528) 	<ul style="list-style-type: none"> • Consult Section 3.0 of ENV 515, <i>Excavation</i> for entry guidelines.

MONITORING PROCEDURES

None required

Evaluated by: Rose Siengubcharti, M.S.

Date: June 2003

TASK NAME

HAND AUGERING

TASK DESCRIPTION

A hand auger will be used to collect near-surface/subsurface soil samples to depths of approximately 1 foot below ground surface. Hand augering involves the manual placement and insertion (turning) of a small auger blade. Soil is displaced by the blade, creating a hole that allows access to soils located below the ground surface. Since only small volumes of soil are disturbed, the potential for airborne release of contaminants when performing this work is minimal.

CHEMICAL EXPOSURE HAZARDS

- Dioxin (dermal)
- Heavy metals (dermal)

PPE

Level D PPE (ENV 301)

- Hard hat
- Short-sleeved shirt (tank tops are not acceptable)
- Long pants (shorts or cut-offs are not acceptable)
- Safety-toed work boots
- Safety glasses
- Hearing protection (as required)

Note: Personnel must wear chemically protective inner (Best Safety n-Dex) and outer (Ansell-Edmont Sol-Vex) gloves when handling soil samples.

OTHER SAFETY EQUIPMENT

None

PHYSICAL HAZARDS

- Slips, trips, falls, and protruding objects
- Heat stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES

- Slips, Trips, Falls, and Protruding Objects (Section 6.1)
- Heat Stress Prevention (ENV 528)

ADDITIONAL SAFETY CONSIDERATIONS

None

MONITORING PROCEDURES

None required.

Evaluated by: Rose Siengubcharti, M.S.

Date: June 2003

TASK NAME

IDW MANAGEMENT

TASK DESCRIPTION	CHEMICAL EXPOSURE HAZARDS
Earth Tech will take part in segregating wastes by removing concrete and soil from holding bins for proper disposal. Concrete, soil, and liquid wastes will be characterized per CCR 22 by collecting a composite sample from the 55-gallon drums. Liquid wastes will be transported offsite to an approved and licensed waste handling or treatment facility.	<ul style="list-style-type: none"> Dioxin (dermal) Heavy metals (dermal)

PPE	OTHER SAFETY EQUIPMENT	PHYSICAL HAZARDS
Level D PPE (ENV 301) <ul style="list-style-type: none"> Hard hat Short-sleeved shirt (tank tops are not acceptable) Long pants (shorts or cut-offs are not acceptable) Safety-toed work boots Safety glasses Hearing protection (as required) <p>Note: Personnel must wear chemically protective inner (Best Safety n-Dex) and outer (Ansell-Edmont Sol-Vex) gloves when handling soil samples.</p>	None	<ul style="list-style-type: none"> Slips, trips, falls, and protruding objects Heat stress

APPLICABLE OPERATIONAL SAFETY PROCEDURES	ADDITIONAL SAFETY CONSIDERATIONS
<ul style="list-style-type: none"> Slips, Trips, Falls, and Protruding Objects (Section 6.1) Heat Stress Prevention (ENV 528) 	None

MONITORING PROCEDURES

None required

Attachment B

General Rules for Subcontractors

General Safety Rules for Contractors

Introduction

The rules and requirements contained in this attachment have been written for the guidance of Contractors who are performing work under contract with Earth Tech. This booklet prescribes general requirements. Additional specific rules may be necessary to ensure the safety of workers on a particular job. The Contractor, working in collaboration with the Earth Tech representative, will be expected to establish such additional rules and procedures as may be necessary to conduct a safe operation and comply with all Earth Tech, regulatory, and insurance requirements and those of our clients. Earth Tech health and safety professionals are available to assist

The term Contractor, as used in this attachment, shall be understood to include any and all persons, sole proprietorships, partnerships, corporations, or other business ventures under contract, oral or written, to Earth Tech

Contractor is responsible for informing its subcontractors of these requirements, for directing and supervising work of subcontractors, and for assuring that its subcontractors adhere to the requirements herein. Earth Tech may request Contractor to provide proof of its subcontractor's adherence to all rules and regulations and will prohibit access to Earth Tech property or job sites or our client's property for those Contractors not in compliance

In order to assist Contractor in following these instructions, a Earth Tech Representative will be assigned to the Contractor to act as Earth Tech's agent in all matters relative to work activities at Earth Tech facilities or job sites. Under no circumstances shall any work be started until the Earth Tech Representative has been contacted, a job orientation has been conducted by the Earth Tech Representative, and all permits, insurance, Earth Tech, client, and regulatory pre-job requirements met.

The Earth Tech Representative and the Earth Tech Health and Safety professionals are authorized to stop any work which they may consider hazardous to Earth Tech personnel or equipment or Contractor personnel. This authority may be delegated to appropriate individuals.

General Safety Rules and Requirements

Accident Reporting

All accidents (personal and property damage) shall be reported orally to the Earth Tech Representative as soon as emergency conditions no longer exist. A written report shall follow within 7 days after emergency conditions are resolved.

Alcohol, Firearms, etc.

Alcoholic beverages, illegal drugs or narcotics, or guns and ammunition are not permitted on Earth Tech property or job sites. Personnel under the

influence of alcohol or drugs shall not be allowed on Earth Tech property or job sites.

Approvals

The Contractor shall be required to obtain pertinent work permits or authorization and approval from the Earth Tech Representative before:

- Working on existing pipelines or equipment
- Entering tanks or closed vessels
- Entering any designated high-hazard areas
- Using torches, electrodes, electronic motors, forges, soldering irons, any open flames, or any device which could produce sparks or ignition source
- Closing walkways, roads, or restricting traffic
- Starting excavations
- Removing tanks from excavations
- Backfilling excavations
- Using utilities such as steam, water, compressed air, or electricity
- Sandblasting, spray painting, or guniting
- Storing flammable materials such as gasoline, oil, paints, oxygen cylinders, etc.
- Walking or working on roofs of buildings or equipment
- Drilling, boring, preparing test pits, or using geophysical equipment or any other exploratory equipment requiring penetration of surfaces
- Operating cranes or similar equipment near overhead power lines or pipelines
- Opening cutting through firewalls or berms
- Fueling or repairing Contractor operating equipment on Earth Tech property or job sites.

Security

For security reasons, entrance to and exit of Earth Tech facilities and job sites is restricted to those areas designated as the Contractor's work area

Speed Limits

All vehicles on Earth Tech job sites and facilities must observe a maximum speed limit of 10 mph unless otherwise posted.

General Safety Rules for Contractors

Vehicle Safety

- All vehicles must be parked in authorized areas only.
- There will be no passing of moving vehicles at job sites where there are narrow roads and short-sight distances.
- Vehicles will only be operated by personnel with valid licenses and good driving records.
- Vehicles shall have all required inspection and operating permits
- Seat belts shall be used.

Safe Work Practices

Communication

Communication and coordination is vital to prevent accidents on construction sites. Every worker must be aware of equipment operating in his vicinity.

Confined Space Entry

Confined spaces include storage tanks, bins, sewers, in-ground vaults, degreasers, boilers, vessels, tunnels, manholes, pits, etc. These enclosures, because of inadequate ventilation and/or the introduction of hazardous gases and vapors, may present conditions that could produce asphyxiation or injury.

Before entering a confined space, Contractor must notify the Earth Tech Representative of intent to enter. The Earth Tech Representative will review with Contractor the safe entry requirements which include:

Removal of Contents. Before entering, confined spaces should be as clean and free of hazardous materials and chemicals as possible. Where appropriate, confined spaces may be purged by water or other suitable means. Purging with hazardous solvents should be avoided where possible.

Isolation All input lines which discharged into the confined space shall be disconnected and capped or isolated. The use of a single in-line valve shut-off as the sole means of isolating the confined space from any input lines is prohibited.

However, the use of a double in-line valving arrangement with a vent or drain in between the two valves is acceptable provided that dangerous air contaminants are not introduced by such venting. Isolation valves shall be locked closed, vent or drain valves shall be locked open, and the key shall be kept by that person performing the job.

Electrical Lockout. Where electrical devices located within the confined space (motors, switches, etc.) are to be repaired or worked on, the line-disconnect switches supplying the power must be tagged and locked in the "OFF" position. The lock key is to be kept by the person performing the job, and only this person is authorized to unlock the switch and remove the tag upon completion of the job. Where more than one person is working on the

line, each must place a lock on the switch and retain his own key.

- Where there are multiple sources of power to an electrical device that supplies power to the device through an automatic or manual bus transfer switch, lockout devices must be placed on the breaker nearest to the electrical device that is to be isolated, and an electrician shall test the power supply lines to ensure that power has been secured.
- Line-disconnect switches supplying power to any mechanical apparatus in the confined space (mixers, conveyors, etc.) must also be tagged and locked in the "OFF" position. This must be done for any entry, even though work will not be performed on the apparatus itself.

Securing of Covers. All manhole and cleanout covers shall be removed and the openings maintained clear of any obstructions. When hinged doors or lids are provided, they shall be secured so they cannot close. See **Excavations and Trenches** for guarding requirements.

Testing Atmosphere. A qualified person (NIOSH Publication No. 80-106) using only equipment approved and tagged for Class 1, Division 1 locations shall make appropriate tests of the atmosphere in the confined space and place a record of the test results at the entrance to the confined space. Testing shall ensure the following:

- Combustible gas and vapor concentrations do not exceed 10 percent of the lower explosive limit
- Oxygen content is no less than 20 percent and no greater than 25 percent
- Appropriate respiratory protective equipment and other appropriate personal protective devices have been provided for all employees when concentrations of toxic materials exceed established threshold limit values (TLVs).

Continuous Monitoring. If the nature of the work to be performed introduces, or has the potential to introduce, harmful air contaminants, continuous monitoring of the atmosphere and/or the oxygen content drops below 20 percent, all personnel shall evacuate the confined space immediately.

Ventilation. All confined spaces found to be unsafe must be ventilated by means of mechanical exhaust systems arranged so as to avoid recirculating contaminated air. The Contractor must contact the Earth Tech Representative to obtain approval not to ventilate. Personnel shall be evacuated immediately in the event of failure of the mechanical ventilation system. The confined space shall be retested prior to reentry following ventilation system repair.

Buddy System. At least two workers shall remain outside the confined space. One standby worker shall be stationed just outside the access opening of the any confined space while such space is occupied. This person shall:

General Safety Rules for Contractors

- Maintain continuous awareness of the activities and well-being of the occupant in the confined space
- Be able to maintain communication at all times
- Be alert and fully capable of quickly summoning help
- Be physically able and equipped to assist in the rescue of an occupant from a confined space under emergency conditions.

Safety Gear and Personal Protective Equipment. All Contractor employees must be instructed in accordance with OSHA regulations regarding safety gear and personal protective clothing, hard hats, respirators, lifelines, and harnesses. Such instructions shall be received and documented before entering any confined space.

Compressed Gas Cylinders

Valve protection caps. Valve protection caps shall be in place when compressed gas cylinders are transported, moved, or stored

Cylinder valves. Cylinder valves shall be closed when work is finished and when cylinders are empty or are moved.

Compressed gas cylinders. Compressed gas cylinders shall be secured against rolling or tipping (roped or chained) at all times, except when cylinders are actually being hoisted or carried

Gas regulators. Gas regulators shall be in proper working order while in use.

Leaks. If a leak develops in a gas cylinder, after donning appropriate safety equipment, immediately remove it to a safe location. If the leak cannot be corrected, report it to the Earth Tech Representative.

Identification of Contents. Cylinders should be permanently marked or stenciled to identify the type of gas in the cylinder.

Breathing Air. All compressed breathing air shall meet OSHA specifications for breathing air quality. All compressed breathing air cylinders shall have their contents checked at the job site for correct oxygen concentration and rejected for breathing air if the oxygen concentration is not $20.7\% \pm 0.2\%$

Oil and oily rags. Oil and oily rags shall be kept away from oxygen equipment.

Cranes, Hoists, and Other Heavy Equipment

Contractor personnel will not be permitted to use hoists and powered apparatus belonging to Earth Tech unless approval is obtained in each instance from the Earth Tech Representative

ROPs. Roll over protection shall be used when conditions or regulations call for such use.

Cutting or Welding

Hot Work/Welding/Burning. "Hot Work" authorization must be obtained from the Earth Tech Representative before any welding, cutting, or other "hot work" is done. "Hot work" permits and results of tests are to be submitted to the Earth Tech Representative at the completion of the job or at the end of each workday.

Welding Flash. Noncombustible or flame-proof shields or screens must be provided to protect welder or others who might be harmed by direct rays or arc

Personal Protective Equipment. Goggles, gloves, aprons, and other personal protective equipment appropriate to the job shall be used.

High Fire-Hazard Areas

- Contractor personnel are responsible to see that a fire watch is maintained and all adjacent combustible materials are protected or removed as designated by the Earth Tech Representative
- Contractor shall provide his own calibrated combustible gas meter or other instruments for checking areas before hot work
- Documentation of calibration shall be submitted to the Earth Tech Representative for review by the Earth Tech Health and Safety Section.
- Contractor is responsible for all testing and monitoring required by applicable regulations and to assure work place safety
- Earth Tech shall have the right, not the responsibility, to perform additional testing. Earth Tech testing shall not be in lieu of Contractor's requirements
- In the event of a bona fide emergency, such as emergency spill response work, and where the Contractor warrants that he cannot conduct the required testing, Earth Tech may upon written agreement then conduct all tests necessary to assure safety and regulatory compliance. The Contractor shall cosign the "hot work" permit form when tests are conducted by Earth Tech personnel.
- Contractor shall provide his own fire extinguisher(s) for welding and cutting, as designated by the Earth Tech Representative

Electrical Safety

Grounding. The noncurrent-carrying metal parts of fixed, portable, or plug-connected equipment shall be grounded. Since ground wires can break, they shall be tested with an electrical resistance meter to assure conductivity as often as necessary to assure safety. Portable tools and appliances protected by an approved system of double insulation need not be grounded.

General Safety Rules for Contractors

Extension Cords. Extension Cords shall be the three-wire type for grounded tools (two-wire is permissible for double-insulated tools) and shall be protected from damage; do not fasten with staples or extend across an aisleway or walkway. Worn or frayed cords shall not be used. Cords shall not be run through doorways where the door could cut or damage them.

Light Bulbs. Exposed bulbs on temporary lights shall be guarded to prevent accidental contact, except where bulbs are deeply recessed in the reflector. Temporary lights shall not be suspended by their electric cords unless designed for this use. Explosion-proof bulb covers shall be used when contact with flammable vapors or gases is likely and shall meet Class I, Division I requirements.

Electrical Receptacles. Receptacles for attachment plugs shall be of the approved, dead-front, concealed contact type. Where different voltages, frequencies, or types of current are supplied, receptacles shall be of such design that attachment plugs are not interchangeable.

Wet Environments. Work done in wet environments shall require ground fault interrupters and water-tight connectors.

Emergency Equipment

Earth Tech's fire equipment is not to be moved, relocated, or otherwise rendered inaccessible unless specific permission is granted in each case by the Earth Tech Representative.

Self-contained breathing apparatus, first aid equipment, fire blankets, stretchers, eyewash fountains, and deluge showers are not to be moved, relocated, or blocked without the express permission of the Earth Tech Representative.

Excavations and Trenches

Permits. Before any excavation work begins, all required permits shall be obtained.

"Dig-Alert". Before any excavation work begins, the existence and location of underground pipes, electrical conductors, etc., must be determined by Contractor who shall in turn notify the Earth Tech Representative.

Cave In Protection. The walls and spaces of all excavations and trenches (which will be entered by people) more than 4 feet deep shall be guarded by shoring, sloping of the ground, or some other equivalent means, in accordance with Cal/OSHA regulations.

Daily Inspections. Daily inspections of excavations shall be made by the Contractor. If there is evidence of possible cave-in or slide, all work in the excavation shall cease until the necessary safeguards have been taken.

Egress. Trenches more than 4 feet deep shall have ladders or steps located so as to require 10 feet or less of lateral travel between means of access.

Backfill. All trenches shall be backfilled as soon as practical after work is completed and all associated equipment removed.

Housekeeping. All Contractor equipment, such as pipe, rebar, etc., shall be kept out of traffic lanes and access ways. Equipment shall be stored in a manner which ensures the safety of Earth Tech and Contractor employees at all times.

Fall In Protection. All trenches shall be completely guarded on all sides. Standard guardrails are preferred. However, when wooden or metal barricades are used for trench guarding, they shall be spaced no further apart than 20 feet, and at least two feet from the edge of the trench. Such barricades shall be at least 36 inches high when erected.

- Battery-lighted barricades shall be used as follows:
 - (1) A minimum of two battery-lighted barricades shall be used at corners, one on each side of the barricade.
 - (2) At least one battery-lighted barricade shall be used where vehicular traffic approaches the trench at right angles.
 - (3) Where trenches parallel roadway, distance between battery-lighted barricades shall not exceed 40 feet unless this requirement conflicts with Item (1), above, and additional units are required.
 - (4) All battery-lighted units shall be serviced as necessary to ensure equipment is operating.
- Caution tape shall be stretched securely between barricades. The caution tape shall be at least 3/4-inch-wide and shall be yellow or yellow and black and may have the words "CAUTION - DO NOT ENTER".
- Barricaded sections immediately adjacent to where pedestrians cross trenches shall be arranged to direct pedestrians to the walkway or bridge.

Encroachment. Use of other trench excavating equipment, or storage of equipment or supplies within a distance equal to the depth of the trench, will not be permitted without approval by the Earth Tech Representative.

Bridges. All pedestrian bridges shall be of sufficient strength to prevent no greater vertical deflection than one-half inch when a 250-pound weight is applied to the center of the bridge.

- Handrails shall consist of intermediate and top rails on both sides of the bridge. The top rail shall be between 42 and 45 inches above the walking surface and be capable of withstanding a lateral force of 200 pounds against the center of the top rail.

General Safety Rules for Contractors

- All surfaces which a person could reasonably contact should be sufficiently free of splinters, nails, or protrusions which may cause injury.
- All bridges intended for vehicular traffic shall be constructed to withstand twice the load of the heaviest vehicle anticipated.

Earth Grading Activity

Vest. All persons within an area where earthmoving are operating shall wear a safety vest or jacket at all times. Vests may be red, orange, or day-glo green in color, but bright or fluorescent orange is preferred. Significantly faded or damaged vest must be replaced.

Communication. Anytime a test pit is to be excavated, the technician shall notify the grading contractor's **authorized** representative for that area. That individual may be acting in the capacity as a dump man, operator, or supervisor from an independent vehicle. Advise that representative of the test pit location and request their cooperation to promote safety during the test period. This should include their advising those under their supervision of your existence in the grading area. Make a notation on your records of the name of the individual with whom you spoke so that the communication is documented.

- Provide notice to the grading contractor
- Identify location of test pit
- Request the cooperation through the completion of the tests and document accordingly.
- A flag must be affixed to any vehicle driving in an earth grading activity area and hazard warning lights shall be operated.

Flags. Every over-the-road vehicle operating in the area of earthmoving equipment activity must carry a flag. The flag must be at least 300 square inches in area with no dimension less than 12 inches. Flags must be high visibility red, orange, day-glo green and mounted approximately 12 feet above grade level.

Hazard Warning Lights. Every over-the-road vehicle operating in the area of earthmoving equipment activity must operate the hazard warning flashers at all times.

Rotating or Flashing Beacon. All vehicles stationary in the grading area shall use a rotating or flashing amber beacon or strobe light on the top of the cab of the vehicle during all field testing.

Orientation of Test Pits. The technician is responsible for selecting a test pit location. Of paramount concern is the technician's safety. The test pit should be located behind the established pattern of grading equipment and outside any existing patterns. The orientation of the pit should include the use of the technician's vehicle as a barrier to potential oncoming traffic. The waste pile created from the excavation of the test pit should be opposite the vehicle so that the test pit is positioned between the vehicle and the waste pile. A flag shall be placed

immediately on top of the waste (spoil) pile, satisfying the same requirements as the vehicle flag.

Zone of Non-Encroachment. The location of the test pit must be selected so that no earthmoving equipment will approach closer than 50 feet from the center of the test pit. This is not only for the technician's safety, but to ensure the integrity of the test. Excessive vibration from the operation of earthmoving equipment operating too closely may impair the accuracy or spoil the test results.

Completion of Tests. Immediately upon completion of tests, record the data and withdraw flags and vehicles outside the grading area to record notes and do calculations.

Fire Prevention

Earth Tech Representative, or his designee, is authorized to correct any condition which he may consider a fire hazard. In any emergency, the site personnel are authorized to act directly with Contractor's Foreman in regard to fire hazards without waiting for the Earth Tech Representative.

Floor Openings

Floor openings shall be guarded by substantial barriers, railings, and/or covering materials strong enough to sustain twice the load of pedestrians or vehicular traffic. Barriers will be supplied by the Contractor.

Where a danger of falling exists for personnel, elevated floor areas must be provided with guardrails. In addition, toeboards shall be provided when the possibility of falling objects striking personnel below exists.

High-Hazard Areas

Although this list may not be all inclusive, there are certain areas and operations at Earth Tech facilities and job sites where extra precautions must be taken because of the nature of the hazards. When starting up any operation, the Contractor is required to check with the Earth Tech Representative for a review of the safety and health rules which apply before entering any of the following areas:

- Confined spaces (tanks, manholes, vaults, pits, etc.)
- Laboratories
- Chemical storage and disposal areas.

The contractor is also required to check with the Earth Tech Representative before any work is done on a flammable gas or solvent line; a tank or vessel that presently contains, or has contained, a flammable material; and before making an excavation anywhere on the site.

Housekeeping

Material should be carefully stacked and located so that it does not block aisles, doors, self-contained breathing apparatus, fire extinguishers, fire blankets, stretchers, emergency eyewash fountains, emergency

General Safety Rules for Contractors

safety showers, fixed ladders, stairways, or electrical breaker panels

- Nails protruding from boards must be removed or bent over.
- All work areas shall be kept clear of form and scrap lumber and all other debris
- Combustible scrap, waste materials, and debris shall be removed at regular and frequent intervals
- Containers shall be provided for the collection and separation of refuse by type. Covers shall be provided on containers used for flammable, combustible, or harmful substances.
- Overhead storage of debris, tools, equipment, pipes, etc., is prohibited.
- At the end of each work day, Contractor shall provide for pick up of all debris such as paper, rags, empty cans and bottles, etc.

Ladders

The use of ladders with broken or missing rungs or steps, broken or split handrails, or with other faulty or defective construction is prohibited.

- Ladders must not be placed adjacent to a door unless the door is locked or guarded.
- Metal ladders shall not be used for electrical work.
- Tie off top of ladder to structure.

Medical Service and First Aid

Emergency Medical Service. Preplanned emergency medical service shall be provided as designated by Contractor and approved by the Earth Tech Representative.

First Aid Kit. Each Contractor shall provide a first aid kit for his employees which meets minimum OSHA requirements.

Mobile Cranes

Mobile cranes, including portable crane derricks, power shovels, or similar equipment, shall not be operated within ten feet of overhead electrical power lines.

Overhead Work

No overhead work shall be performed when, as a result of that work, the possibility of a falling object striking any person exists. Do not work above any person at any time.

Personal Protective Clothing and Equipment

In certain construction and maintenance operations, personal protective equipment such as safety glasses, chemical goggles, respirators, hard hats, and protective clothing is required. The type of protective equipment to be worn will be determined by the

degree of exposure to the potential hazard. There will be very few occasions when hard hats and eye protection will not be required at Earth Tech job sites. When in doubt of the safety measures to be observed, Contractor shall contact the Earth Tech Health and Safety Section. This shall not, however, relieve Contractor of his responsibilities to determine appropriate protection.

Eye protection is required when engaging in such operations as the following:

- Drilling, chipping, grinding, wire brushing
- Handling caustics and acids
- Breaking bricks or concrete
- Hammering chisels, drift pins, etc
- Burning or welding
- Other situations which create a possible eye hazard, e.g., chemical environments.

Photographs

Only Earth Tech photographers, with permission from the client, are permitted to carry cameras or take pictures. If progress or finished construction photographs are desired, request for same should be made through the Earth Tech Representative.

Power Tools

Power and Air-Actuated Tools. Gasoline-powered, electric, or air-actuated tools are not to be used on Earth Tech property or job sites without prior approval of the Earth Tech Health and Safety Department. To obtain approval, Contractor must contact the Earth Tech Representative.

Explosive-Actuated Tools. Explosive-actuated (powder-actuated) fastening tools shall meet the design requirements in "American National Standard Safety Requirements for Explosive-Actuated Fastening Tools" (ANSI A10.3-1970). A tool which does not meet these design standards cannot be used.

- Power tools shall never be left unattended in a place where they would be available to unauthorized persons
- Power tools shall not be used in explosive or flammable atmospheres.

Fall Protection

Appropriate fall protection, such as safety harness and lanyard, must be worn when worker is exposed to falling more than 6 feet. Lanyard or lifeline must be tied off to appropriate structure capable of supporting five times the weight of the person (nominal 1000 pounds).

- Appropriate fall protection, such as safety harness and lanyard, must be worn when working above eight feet on straight or extension ladders when the work involves pushing, pulling, or action which may dislodge the person from the ladder

General Safety Rules for Contractors

- Safety harnesses are also required on swinging or portable scaffolds when handrails and toeboards are not provided (eight feet or more above ground or floor level).
- Safety harnesses and lifelines (including extraction devices for top entry spaces) are required on all work performed in confined spaces where an oxygen deficiency or toxic vapors may exist.
- All lifelines shall be safety secured to stable and adequate supports.
- Safety harnesses and lifelines must be worn on rooftops where there are no guardrails and where the work is within ten feet of the edge.
- Wire, synthetic, or fiber rope used for suspended scaffolds shall be capable of supporting at least six times the rated load.
- No riveting, welding, burning, or open flame work shall be performed on any staging suspended by means of fiber or synthetic rope.
- Tested fiber or approved synthetic ropes shall be used for or near any work involving the use of corrosive substances.
- All scaffolds, boatswain's (bosun's) chairs, and other work access platforms shall conform to the requirements set forth in the federal OSHA Regulations for Construction (29 CFR 1926.451) except where the specifications in ANSI A10.8 7 or state or local regulations are more rigorous.

Salamanders

- "Hot work" authorization must be obtained from the Earth Tech Representative before using a salamander.
- Salamanders must be a Factory Mutual or Underwriters Laboratories-approved type.
- Position salamanders away from all combustible material to reduce the possibility of uncontrolled fire.
- Guard salamanders from traffic to prevent them from being overturned.

Scaffolds

All scaffolds, whether fabricated on site, purchased, or rented, shall conform to the specifications found in ANSI A10.8, Safety Requirements for Scaffolding. Rolling scaffolds shall maintain a three-to-one height-to-base ratio.

- The footing or anchorage for a scaffold shall be sound, rigid, and capable of carrying the maximum intended load without settling or displacement.
- Unstable objects, such as barrels, boxes, loose bricks, or concrete blocks, shall not be used to support scaffolds or planks.
- No scaffold shall be erected, moved, dismantled, or altered except under the supervision of competent persons.
- Scaffolds and their components shall be capable of supporting at least four times the maximum intended load without failure.
- Guardrails and toeboards shall be installed on all open sides and ends of platforms more than 10 feet above the ground or floor.
- Scaffolds measuring four to ten feet in height, and having a horizontal dimension of less than 45 inches, shall have standard guardrails installed on all open sides and ends of the platform.

Smoking and Open Flames

Smoking and the use of open flames are strictly prohibited in areas where flammable liquids, gases, or highly combustible materials are stored, handled, or processed. Obey "No Smoking" signs. Smoke only in designated areas.

Solvents and Paints

- Adequate ventilation must be maintained at all times when paints or solvents are used.
- Personnel should use proper respiratory protection and protective clothing when toxicity of the material requires such protection.
- Flammable solvents and materials must be used with extreme caution when possible sources of ignition exist.
- Flammable paints and solvents must be stored in an approved (Factory Mutual or Underwriters Laboratories) flammable liquids storage cabinet when storage is required inside the buildings. If an approved cabinet is not available, paints and solvents must be removed from the building when not in use.
- Flammable liquids must be dispensed in safety cans with flash arresters bearing a Factory Mutual or Underwriters Laboratories approval. These containers must be clearly identified as to their contents.
- Material Safety Data sheets, for materials used by the Contractor, shall be maintained by the Contractor, and a copy provided to the Earth Tech Representative.

Tarpaulins

When tarpaulins are required for the detection of hot slag, dust, paint drippings, etc., or as security barriers, they shall be flame-resistant and in good condition.

General Safety Rules for Contractors

Tools

Hand and power tools shall be kept in safe operating condition. Mushroomed heads on cold chisels, star drills, etc., are unsafe and should not be used. Hammers should have handles which are not cracked, split, or broken.

Nonsparking tools may be necessary in certain areas where flammable materials are handled or where sparks could create an explosion.

Transporting Material and Equipment

Extreme care must be taken while carrying sections of pipe, conduit, and other materials to assure safety to Earth Tech, Contractor, and client personnel and property. This includes, but is not limited to, flagging and use of two people to carry pipe of lengths greater than 10 feet.

- Tools, materials, and equipment must not be left unattended in access ways.
- Tools, material, and equipment shall not be removed from the job site without permission of the Earth Tech Representative.

Walking and Work Surfaces

- Workroom floors shall be clean and, to the extent possible, dry.
- Drainage mats, platforms, or false floors should be used where wet processes are performed.
- Floors shall be free from protruding nails, splinters, holes, and loose boards or tiles.
- Permanent aisles or passageways shall be marked.
- Floor holes shall be protected by covers that leave no openings of more than one inch wide.
- Floor openings into which persons can accidentally walk shall be guarded by standard railing and toeboards.
- Open-sided floors, platforms, and runways higher than four feet shall be guarded by standard railings.
- Toeboards shall be used wherever people can pass below, or where hazardous equipment or materials are located below.

Warning Signs

All posted warning, safety, and security signs and barriers shall be observed. Additionally, Contractor shall provide warning signs, barriers, barricades, etc. wherever such protection is needed. Where signs and barricades do not provide adequate protection, particularly along a road, flagmen shall be used.

Regulatory References

- (a) *Standard Operating Safety Guides*, USEPA, November 1984
- (b) Title 29 of the Code of Federal Regulations, Part 1910 (29 CFR 1910), Occupational Safety and Health Standards (USDOL/OSHA), with special attention to Section 120, Hazardous Waste Operations and Emergency Response
- (c) Title 29 of the Code of Federal Regulations, Part 1926 (29 CFR 1926), Safety and Health Regulations for Construction (USDOL/OSHA), with special attention to Section 1926.65, Hazardous Waste Operations and Emergency Response

Contractors are expected to brief their employees on these requirements and enforce these rules with their employees. Earth Tech management may stop or suspend work at any time the Contractor fails to comply with Earth Tech rules and regulations.

Attachment C

Earth Tech Environmental Practice Procedures

ENV 106

ILLNESS, INJURY, AND NEAR-MISS REPORTING

Published: January 20, 2003

Revised: N/A

Page: 1 of 3

SUMMARY:

All work-related injuries, illnesses, and near-miss situations must be documented and reported to the EH&S Department and Earth Tech management in a timely and accurate manner.

1.0 DEFINITIONS

SRI – Supervisor's Report of Injury (see Attachment 1)

WCA – Workers' Compensation Administrator

Near Miss – Any non-injury safety incident (accident, etc) where an injury to an on-site worker or member of the public could have occurred, or where more than \$500 in property or vehicle damage occurs.

2.0 RESPONSIBILITIES

2.1 EH&S Department

- 1 Notifying Earth Tech's Medical Case Management Provider of any work-related injury or illness case that requires continuing medical treatment or care
- 2 Notifying the appropriate District and Division Manager of the case
- 3 Reviewing all reports and documentation pertinent to any work-related injury, illness, or near miss involving any Earth Tech employee (including Workers' Compensation coverage)
- 4 Reporting fatalities and/or hospitalization cases to the appropriate OSHA Area Office and to the Corporate Legal Department
- 5 Reporting to the Human Resources Department cases involving lost work time of more than five days.
- 6 Based on the type/severity of the incident, initiating an Incident Investigation Review (IIR) See ENV 107, *Accident Investigation*.

2.2 Section Managers

- 1 Reviewing the SRI prepared by the workplace supervisor as a result of a work-related injury, illness, or near miss and providing corrective action(s) to minimize risk and future incidents
- 2 Forwarding the completed SRI to the EH&S Manager within 8 hours.
- 3 Participating in the IIR

2.3 Workplace Supervisors

- 1 Notifying the appropriate EH&S Manager of any work-related fatality, injury, illness, or near miss
- 2 Notifying Earth Tech's Workers' Compensation third-party administrator, Sedgwick Claims Management Services (SCMS), of any work-related injury or illness that has the potential to require medical treatment or care
- 3 Initiating an SRI for any work-related injury, illness, or near miss and faxing it to the EH&S Department within 24 hours
- 4 Forwarding copies of the SRI to the Section Manager and the EH&S Manager
- 5 Completing additional documentation/forms as directed

ENV 106

ILLNESS, INJURY, AND NEAR-MISS REPORTING

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2.4 All Earth Tech Employees

1. Notifying his/her workplace supervisor immediately of any injury, illness, or near miss, and stating whether any medical treatment will be sought

2.5 Earth Tech Subcontractor Organizations

1. Notifying Earth Tech's workplace supervisor of any fatality, injury, illness, or near miss
2. Providing Earth Tech's workplace supervisor with copies of documentation prepared in response to an injury, illness, or near miss that is determined to be work-related

3.0 PROCEDURES

The following response procedures will be followed in the event of any work-related injury, illness, or near miss occurring at an Earth Tech work location

3.1 Injury/Illness Involving Earth Tech Personnel

1. Affected Employee: Each injured/ill employee must notify his/her supervisor immediately that an incident has occurred, the circumstances involved, the nature and extent of the injuries/illness, and whether medical treatment may be required. Except for emergency aid, affected employees will follow the supervisor's instructions concerning obtaining medical treatment.
2. Workplace Supervisor: The workplace supervisor must **immediately** perform the following notifications:
 - a. Verbally to the EH&S Manager, with a follow-up SRI completed and faxed within 24 hours (see attached SRI, page 2).
 - b. Verbally to his/her Manager, and secure the Manager's signature on the SRI within 24 hours. If the supervisor's Manager is unavailable, obtain the signature from a designated acting Manager.
 - c. For work-related injuries/illnesses requiring medical treatment, verbally notifying Earth Tech's Workers' Compensation insurance carrier within 8 hours (SCMS: 877-261-8926). Information required by SCMS at the time of notification includes all items in the first two sections of the SRI. The SCMS Claim# assigned to the case will be noted on the SRI.
 - d. Fatalities must be reported to the appropriate EH&S Manager and Corporate EH&S Director within 2 hours.
3. Section Manager: Review the SRI as prepared by the workplace supervisor. Complete Section 3 of the form and forward to the WCA within 24 hours of receipt.
4. WCA/EH&S Department:
 - a. As necessary, provide direction to the workplace supervisor concerning medical treatment for the affected employee(s).
 - b. Review the in-progress SRI provided by the workplace supervisor. Coordinate with Earth Tech's Medical Case Management Provider on all medical issues.
 - c. Notify the Human Resources Department concerning any work-related injury or illness involving lost work time.
 - d. Review progress of Workers' Compensation cases with the third party administrator.

3.2 Injury/Illness Involving Subcontractor Personnel

1. Affected Subcontractor Employee: Notify his/her supervisor immediately that an incident has occurred.

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2. Subcontractor's Workplace Supervisor: Notify the Earth Tech workplace supervisor that an incident has occurred and provide a description including all available information related to the incident
3. Earth Tech Workplace Supervisor: Notify the EH&S Manager of the incident
4. Subcontractor Organization: Provide Earth Tech with copies of all internal incident documentation (e.g., incident report, medical information, investigation information)

3.3 Near-Miss Incident

1. Affected Employee: Each affected employee must notify his/her supervisor immediately that an incident has occurred and the circumstances involved
2. Workplace Supervisor: The workplace supervisor must perform the following notifications within 8 hours of any near-miss incident:
 - a Verbally to the EH&S Manager, with a follow-up SRI completed and faxed within 24 hours (see SRI instructions)
 - b Verbally to their Manager, and secure the Manager's signature on the SRI within 24 hours
3. Section Manager: Review the SRI as prepared by the workplace supervisor. Complete Section 3 of the form and forward to the EH&S Manager within 24 hours of receipt
4. EH&S Manager: Review the in-progress SRI provided by the workplace supervisor to monitor future actions and developments that may involve medical attention

4.0 INTERNATIONAL OPERATIONS

The following reporting procedure will be implemented at Earth Tech international locations.

4.1 Injury and Illness Reporting

The appointed Health and Safety Manager will contact the appropriate EH&S Manager within 24 hours for review/discussion/corrective actions to be implemented.

4.2 Documentation

If an international location has an established form to be used for reporting incident, illness, injury, fatality, or Workers' Compensation, that form should be completed by the Health and Safety Manager and sent to the Earth Tech Corporate EH&S Department. Otherwise, Health and Safety Managers may complete the Supervisor's Report of Incident (SRI) form, attached.

5.0 ATTACHMENTS

Attachment 1: Supervisor's Report of Incident (SRI)

Supervisor's Report of Incident

This is an official document to be initiated by the injured employee's Supervisor regarding possible employee injury. Please answer all questions completely Fax to EH&S within 24 hours of the injury: (804) 515-8313 See 2nd page for instructions.

Section 1: Data for Employee Involved in Incident – To be completed by supervisor Avoid reporting delays and complete as much as possible now; submit fully completed form (including corrective actions) at a later time.

Complete Sections 1 & 2 then call 877-261-8926 (TYCO) to obtain a Sedgwick Claim#: _____				
Office Location Code (3-digit number) _____		Employee Department (4-digit number) _____		
Employee Office Location Address _____				
<input type="checkbox"/> Injury	<input type="checkbox"/> Illness	<input type="checkbox"/> Injury From a Vehicle Incident	<input type="checkbox"/> Near Miss	
Employee Name	Work Phone	Home Phone	Birth Date	SSN
Home Address (City, State, Zip) _____				
Hire Date	Hourly Wage	Marital Status	Dependents	Job Title

Section 2: Supervisor (Must complete each item) - Print Clearly

Date of Incident	Time	Date/Time Reported	To Whom
Client Name/Job Number	Job Assignment at Time of Incident		Time Shift Began
Exact Location & Address of Incident _____			
Describe Incident _____			
Root cause of Incident _____			
Nature of Injury _____			
Medical Attention? <input type="checkbox"/> Yes <input type="checkbox"/> No If yes, describe treatment _____			
Dr./Hospital Name		Address/Phone of Hosp.	
Witness Name (Any witnesses should attach a short statement) _____			
Did injured leave work? When?		Has injured returned to work? <input type="checkbox"/> Yes <input type="checkbox"/> No	
Corrective Action(s) to Prevent Future Occurrence: _____			
Supervisor/Foreman (Print Name)		Signature	Telephone Date

Section 3: Manager

Comprehensive comments on root cause of incident and corrective action _____		
Manager (Print Name)	Signature	Telephone Date

Section 4: Environmental Safety and Health Professional

Concur with action taken? <input type="checkbox"/> Yes <input type="checkbox"/> No Remarks: _____		
<input type="checkbox"/> No Medical Care <input type="checkbox"/> First Aid Only <input type="checkbox"/> Medical Care by Medical Professional <input type="checkbox"/> Fatality OSHA Recordable <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Pending <input type="checkbox"/> Days away from work _____ <input type="checkbox"/> Restricted Days _____		
ESH Professional (Print Name)	Signature	Date

Supervisor's Report of Incident Instructions For Completion

The following types of incidents must be reported using this form:

1. Occupational Injury or Illness (includes first aid only, medical treatment, hospitalization, fatality)
2. Vehicle Accident Injuries
3. Near Miss (incident where employee(s) could have been injured) this includes vehicle incidents

INSTRUCTIONS

1. Employees must report such incidents to their Supervisor immediately
2. The Supervisor must complete **Sections 1 and 2, Employee Data and the Supervisor Section** of the SRI. Any work-related injury or illness that requires medical care in the United States will require notifying SCMS at 877-261-8926
3. The Supervisor must verbally notify his/her Manager within 8 hours, who in turn must sign **Section 3, Manager**, of the SRI. To avoid delaying the SRI process, a separate copy of the SRI with the Manager's signature can be faxed within 24 hours to EH&S.
4. The Supervisor must also verbally notify EH&S immediately with a follow-up SRI faxed within 8 hours (see below for fax numbers). EH&S will review and complete **Section 4, Environmental Health and Safety**. For near-miss situations that could have resulted in an injury to an employee, the Supervisor must notify his/her Manager (see Item 3 above) and EH&S with a follow-up SRI faxed within 24 hours.

PRIMARY CONTACTS

GWES		Construction
East:	Ron Partilla, CSP Telephone: 616-940-4416 Fax: 616-940-4495	Chuck Pryor, CSP Telephone: 858-536-5610 Fax: 877-525-5211
West:	Bob Poll, CIH, CSP Telephone: 562-951-2242 Fax: 562-951-2100	Contract Operations
Administrator:	Chelsea Ryan Telephone: 804-515-8557 Fax: 804-515-8313	Mark Robinson, CSP Telephone: 920-451-2862 Fax: 920-458-0537
Director:	Dale Prokopchak, CIH, CSP Telephone: 804-515-8556 Fax: 804-515-8557	

ENV 201
GENERAL FIELD OPERATIONS REQUIREMENTS

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SUMMARY: The fundamental requirements presented in this procedure are generally applicable to Earth Tech work activities conducted at any job site, unrelated to the type of work activity being performed.

1.0 WORK SITE RULES

1. Each office/project site will have the appropriate labor posters (including state or Federal OSHA Notification) posted prominently. A source for these forms can be found on the EH&S website at <http://corp.earthtech.com/healthsafety>
2. Legible and understandable precautionary labels will be prominently affixed to all containers of chemical raw materials, intermediates, products, by-products, mixtures, scrap, waste, debris, and contaminated clothing, per DOT, EPA, OSHA, or other applicable regulations.
3. At least one person qualified in the administration of first aid and cardiopulmonary resuscitation (CPR) will be present at all times at each Earth Tech work site unless exempted by the EH&S Department. Recognized agencies providing training and qualification in First Aid/CPR are the American Red Cross and the American Heart Association. A first aid kit will be provided at each project site. As appropriate, equipment on site will be bonded and grounded, spark proof, and explosion resistant. Ground fault interrupters will be utilized for all electrical equipment.
4. Hazards from protruding objects, careless movements, or placement of materials on paths or foot traffic areas present a problem with regard to slips, trips, falls, and puncture wounds. Personnel will use a reasonable amount of effort to keep slip, trip and fall hazards to a minimum.

2.0 EMPLOYEE PERFORMANCE RULES

1. Each employee, as a condition of employment, is required to comply with the health and safety procedures and the site safety plan governing in each area the employee is required to work. Project managers are to review records of each employee to ensure that all requirements are in compliance.
2. No one will initiate work on a project involving hazardous materials until appropriate training as required by regulation, contract and/or EH&S procedures have been implemented.
3. All employees are directed to immediately bring to the attention of the Site Supervisor or Site Safety Officer any unsafe condition, practice or circumstance.
4. The following practices are expressly forbidden during operations on work sites:
 - Smoking, eating, or drinking while on site except in designated areas;
 - Ignition of flammable or reactive materials;
 - Entry on site without proper safety equipment;
 - Conduct of operations on site without backup personnel;
5. Every accident is to be reported to the Site Supervisor immediately, whether or not anyone is injured.
6. Employees may not alter or attempt to repair any item of safety equipment unless specifically authorized and qualified.
7. An employee must not attempt to move or lift heavy or bulky objects beyond his capacity. No employee will lift more than 49 pounds without aid.
8. Possession or use of intoxicants or drugs on company premises or job sites is prohibited. Employees may not report for work or perform duties while under the influence of intoxicants or drugs. Use of prescription drugs are to be reported to the Site Supervisor and shall not impair the ability of the worker to work safely.
9. Walking under or working under a suspended load is not permitted.
10. Personnel on site will use the "buddy" system (pairs), working alone on any job site is forbidden. Communication or visual contact will be maintained between crew members at all times.

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GENERAL FIELD OPERATIONS REQUIREMENTS

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3.0 EMERGENCY PLANNING

- 1 A sufficient number of fire extinguishers, with a minimum rating of 1A:10B:C, will be strategically located throughout the areas where active work is progressing so that travel distance to an extinguisher from any location is less than 75 linear feet
- 2 Where work operations involve the on-site handling or use of corrosive materials (strong acids/bases, etc.) or materials which can cause significant eye irritation/damage, a fixed or portable eye wash unit will be located within 15 feet of the work area. The eyewash unit will meet the latest requirements of American National Standards Institute (ANSI) Standard Z358.1, and be capable of supplying hands-free irrigation of both eyes for at least 15 minutes at a flow rate of at least 0.4-gallon per minute. At the discretion of the EH&S Department, and emergency drench shower, meeting the requirements of ANSI Z358.1, will also be provided

4.0 STANDARD OPERATING PROCEDURES

The EH&S Department has developed standard operating procedures (SOPs) addressing EH&S requirements for performance of many types of field activities. The requirements are found in the ENV 500-series Procedures, *Activity-Specific Safe Operating Procedures (SOPs)*.

REFERENCES: ENV 208 – *Injury and Illness Prevention Program*

ENV 202 SAFETY MEETINGS

Published:	January 20, 2003
Revised:	N/A
Page:	1 of 1

SUMMARY: Periodic safety meetings will be held at all job sites to coordinate work activities and inform employees of the potential hazards associated with the work tasks

1.0 PROJECT INITIATION/KICK-OFF

Where specified in the project-specific EH&S documentation (see ENV 102), an kick-off safety meeting will be conducted prior to the start of field operations, and will involve representatives of all organizations working on the job site. Topics for this meeting will include:

- Communication of all on site EH&S responsibilities and authority
- Communication of organizational EH&S performance expectations
- Identification of significant project EH&S issues/hazards and solutions
- Coordination of organizational EH&S conflicts and interactions

A Pre-Task Planning Log for Safety form is included as Attachment 1.

2.0 ON-SITE MEETINGS

Safety meetings will be conducted at all job sites for the following operational milestones:

1. Project Start-up: On the first day of field operations for a new project or a new phase of work
2. Periodic: On a regular, recurring frequency of not less than once per week (daily meetings are required for HAZWOPER activities)
3. Significant Personnel Turn-over: The start of any work day where a new organization begins work on site or more than 25 percent of the day's work force is new to the site
4. Accident Recovery: The start of the work day following any accident which results in more than \$1000 dollars in property damage or an where an injury to one or more personnel requires medical treatment (discuss the accident, its causes and preventive measures)

The meetings will be documented on the *Tailgate Safety Briefing Form Sign-In Log*, found in Attachment 1

3.0 SUPPLEMENTAL SAFETY TRAINING

The Site Supervisor or Site Safety Officer can implement worker training on general safety topics as part of routine on-site training activities. Where such training is conducted it will be documented on the *Safety Training Log*, found in Attachment 2

REFERENCES: ENV 102 – *General EH&S Plan Requirements*

ATTACHMENTS: Attachment 1 – *Pre-Task Planning Log*
Attachment 2 – *Tailgate Safety Briefing Sign-In Log*
Attachment 3 – *Safety Training Log*

PRE-TASK PLAN FOR SAFETY

Project: _____ Location: _____
 Date: _____ Shift: _____
 Foreman: _____ PM/RM: _____
 General Foreman (Sign after Review): _____

Description of Work: _____

HAZARD IDENTIFICATION

Housekeeping _____ Evacuation Process _____
 High Voltage _____ Trenches Properly _____
 cables/hot rails _____ shored/sloped _____
 Requires Fall _____ Asbestos or Lead _____
 Protection _____ paint _____
 Open Holes _____ Confined Space(s) _____
 Guarding _____
 Materials/ Scrap _____ Hot Work Protection _____
 Noise _____ High Temperature _____
 Working above/ _____ Carbon Monoxide _____
 below workers _____ (150 PPM = evacuate area)
 Acids/ Caustics _____ Radiation _____
 Toxins _____ Hazardous Material _____

Task Safety Checklist (check all that apply)

Personal Protective Equipment	YES	NO	N/A	Housekeeping	Yes	NO	N/A
Goggles/Face shield	_____	_____	_____	Work Surface Level	_____	_____	_____
Gloves	_____	_____	_____	Aisles, Stairs, Floors Clean	_____	_____	_____
Rubber boots/suits	_____	_____	_____	Storage of Materials	_____	_____	_____
Respirators	_____	_____	_____		_____	_____	_____
Body Harness/Shock absorbing lanyard	_____	_____	_____	Material Handling/Equipment Inspection	_____	_____	_____
Welding Shield	_____	_____	_____	Cranes or Cherry Pickers	_____	_____	_____
Leather Sleeves/coat	_____	_____	_____	Air Tuggers	_____	_____	_____
Ear Plugs	_____	_____	_____	Rigging Checked	_____	_____	_____
Long Sleeve Shirts	_____	_____	_____	Cables, Ropes, Slings	_____	_____	_____
Fire Retardant Clothing	_____	_____	_____	Chain Falls	_____	_____	_____
	_____	_____	_____	Pre-Lift Required	_____	_____	_____
Energized Equipment	_____	_____	_____		_____	_____	_____
Lockout Verified	_____	_____	_____	Fall Protection	_____	_____	_____
All Locks Labeled/ Tagged	_____	_____	_____	Rope Grabs	_____	_____	_____
Broken/ Exposed Wiring	_____	_____	_____	Retractable	_____	_____	_____
	_____	_____	_____	Vertical Lifelines	_____	_____	_____
Fire Protection	_____	_____	_____	Horizontal Lifelines	_____	_____	_____
Proper Fire Extinguisher & Fire Hose	_____	_____	_____	Guardrail System – Handrail,	_____	_____	_____
Flammable Materials Removed or	_____	_____	_____	Midrail, toeboard	_____	_____	_____
Protected	_____	_____	_____	Floor Openings Protected	_____	_____	_____
Fire Blankets	_____	_____	_____		_____	_____	_____
Fire Watch Required	_____	_____	_____	Miscellaneous	_____	_____	_____
Area Need to be Flagged	_____	_____	_____	Ladders Secured	_____	_____	_____
	_____	_____	_____	Scaffolds Inspected	_____	_____	_____
Tools	_____	_____	_____	Rebar Protected	_____	_____	_____
Proper Tools for the Job	_____	_____	_____	Pinch Points	_____	_____	_____
Ladder Inspection	_____	_____	_____	Purge Requirements	_____	_____	_____
Hand Tools in Good Condition	_____	_____	_____	Trailer Inspection	_____	_____	_____
Air hoses secured	_____	_____	_____	Daily Shift Ending Audit	_____	_____	_____
Ground Fault protection in place	_____	_____	_____	(Assure Equip & Area is secure)	_____	_____	_____
Oxygen/ Acetylene tied off	_____	_____	_____		_____	_____	_____

Permits** Required Complete

Yes	No
_____	_____
Work Permit	_____
Excavation	_____
Confined Space	_____
Hot Work	_____
MSDS Available	_____
Special Written Procedure	_____

** Completing this form does NOT replace completion of the required permits

Specific Work Requirements:

Alternative Work Areas:

Safety & Productivity Improvement Suggestion(s):

Voltage of Equipment Used

PRE-TASK PLAN FOR SAFETY (Continued)

Equipment Required: _____
Engineering Required: _____
Scaffolding Required: _____
Other: _____

Control Measures

Area Secured: _____
Warning Tape _____
Barricades _____
Roof Perimeter Protection _____
Other: _____
Escape Route Identified _____
Task Safety Checklist Completed _____
Other: _____

Verification of Understanding
(Crew members sign to assure that they understand the plan)
Print _____
Sign _____

Post Task Inspection Checklist		
	Yes	No
Post-Job Cleanup	_____	N/A
Secured Installed Materials	_____	_____
Hot Work Monitored after Work Completed	_____	_____
Barricades Installed where Needed	_____	_____
Equipment Shut Down/ Secured	_____	_____
Locks Removed	_____	_____

Emergency Numbers EH&S Contacts

Environmental Services
Dale Prokopchak, CIH, CSP (804) 839-8312
Bob Poll, CIH, CSP (562) 884-1414
Ron Partilla, CSP, OHST (616) 446-6911

Construction Services
Chuck Pryor, CSP (858) 705-1653

Director
Alden Tansey (858) 536-5610

Shift Manager: _____

Project Manager: _____

Earth Tech

Pre-Task Planning Form For Safety



E A R T H T E C H

Earth Tech Tailgate Safety Briefing Sign-In Log

Time:

Company Name:

This sign-in log documents the topics of the tailgate safety briefing and individual attendance at the briefing. Personnel who perform work operations onsite are required to attend each safety briefing and acknowledge receipt of such briefings daily.

TOPICS COVERED:

- ☐ General PPE usage
- ☐ Hearing Conservation
- ☐ Respiratory Protection
- ☐ Personal Hygiene
- ☐ Exposure Guidelines

- ☐ Decontamination Procedures
- ☐ Smoking, Eating, and Drinking
- ☐ Slips, Trips, and Falls
- ☐ Heat Stress
- ☐ Site Control
- ☐ Emergency Procedures

- ☐ Existing Work Zones
- ☐ Lockout/Tagout Safety
- ☐ Excavation/Confined Space Safety
- ☐ New Work Procedures
- ☐ _____

Personnel Sign-in List

[illegible]

SAFETY TRAINING LOG

Project Name: _____

Project No.: _____

Date: _____

Time: _____

Page 1 of 2

Briefing Conducted By:

Signature: _____

Company Name:

This sign-in log documents the safety training conducted in accordance with various Parts of 29 CFR 1910 and 29 CFR 1926 as well as other applicable regulatory requirements. Earth Tech personnel who perform work activities in field/facility environments are required to attend each safety training session and acknowledge receipt of such training at least weekly or prior to a change in site/facility-specific operations or conditions. Additional training topics and/or regulations can be added to address ongoing site/facility operations. The assigned Manager (i.e., project, construction, response, facility, etc) is instructed to maintain the completed documents at the facility for review for the duration of the project.

TOPICS COVERED:

- | | | |
|--|--|---|
| <input type="checkbox"/> General PPE Usage | <input type="checkbox"/> Site -specific Guidelines | <input type="checkbox"/> Emergency Procedures |
| <input type="checkbox"/> New Work Procedures | <input type="checkbox"/> Slips Trips and Falls | <input type="checkbox"/> Elevated Work Surfaces |
| <input type="checkbox"/> Personal Hygiene | <input type="checkbox"/> Heat/Cold Stress | <input type="checkbox"/> Construction Safety |
| <input type="checkbox"/> HAZCOM Issues | <input type="checkbox"/> Confined Space Entry | <input type="checkbox"/> Hearing Conservation |
| <input type="checkbox"/> Exposure Guidelines | <input type="checkbox"/> Severe Weather | <input type="checkbox"/> Other: _____ |

Personnel Information

Printed Name

Signature

Company Name

ENV 205
PERSONAL PROTECTIVE EQUIPMENT

Published: January 20, 2003

Revised: N/A

Page: 1 of 4

SUMMARY: Requirements for use of protective clothing and equipment will be specified by the EH&S Department on a task-by-task basis. The performance characteristics of the protective equipment will meet the following requirements.

1.0 PROTECTIVE EQUIPMENT PERFORMANCE SPECIFICATIONS

Requirements for use of protective equipment are specified by the EH&S Department, on a task-by-task basis, in the project EH&S documentation. All protective equipment used by Earth Tech personnel must meet or exceed the following performance requirements.

1.1 HEAD PROTECTION

Hard hats will meet the requirements of the latest version of ANSI Z89.1 or CSA Z94.1.

1.2 EYE PROTECTION

Eye protection (safety glasses) will meet the requirements of the latest version of ANSI Z87.1 or CSA Z94.3. Sideshields are only required where specified by the client or in the project EH&S documentation, however ALL safety glasses will meet the following minimum requirements:

1. Provide adequate protection against the particular hazards for which they are designed
2. Be reasonably comfortable when worn under the designated conditions
3. Fit snugly and not unduly interfere with the wearer's movements
4. Be easily cleaned and sanitized.

Contact lenses do not provide eye protection; contact lens wearers must use the same additional eye protection as non-lens wearers.

1.3 FACE PROTECTION

Face protection (face shields) will be used when there is a significant splash hazard, or where there is an increased hazard from impact (e.g., use of a bench grinder). Face shields used on site must meet the requirements in the latest version of ANSI Z87.1 or CSA Z94.3.

1.4 HEARING PROTECTION

Hearing protectors can be either ear plugs or ear muffs, but must provide a minimum noise reduction rating (NRR) of 26.

1.5 FOOT PROTECTION

All footwear used on site must provide ankle support (minimum height of 6 inches) with leather uppers, and must provide a safety-toe meeting the specifications in the latest version of ANSI Z41PT91 (M/I 75, C75).

1.6 HAND PROTECTION

Hand protection serves two purposes:

- Control of physical hazards
- Control of skin contact with hazardous materials

1.6.1 Control of Physical Hazards

Where workers are exposed to physical hazards the use of standard leather or cloth work gloves will be employed. These gloves do not need to conform to any ANSI or other standard, however selected gloves should:

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PERSONAL PROTECTIVE EQUIPMENT

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Revised: N/A

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1. Be of sturdy construction
2. Be intended to protect against the particular hazard(s) associated with the job (e.g., insulated gloves for hot work)
3. Properly fit the worker's hands

1.6.2 Control of Skin Contact With Hazardous Materials

Gloves intended to provide chemical protection must be rated by the manufacturer as effective against the substance(s) expected to be encountered. Specific selection will be made on a task-by-task basis and approved by the EH&S Department.

1.7 FALL PROTECTION

Fall protection equipment includes full-body harness, body belts, safety lines and attachment devices used to prevent or arrest falls by employees working unprotected by a rail or net system at heights greater than 6 feet above ground. Fall protection devices will also be used by workers operating from manlifts (at heights greater than 6 feet) if any portion of their body other than hand/arms extends beyond the rail system, or when one or more sides of the lift is unprotected. Earth Tech will implement 100% fall protection in all work areas.

Fall protection equipment must meet the following requirements:

- All fall arrest systems must utilize a full-body harness (body belts are prohibited for fall arrest).
- The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head.
- All lanyards and lifelines must have a minimum breaking strength of 5,000 pounds (attachment points for these lines must also meet this requirement).
- Fall arrest systems must limit the free-fall to 4 feet or less, and subject the worker to no more than 1800 pounds of arrest force.
- Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection until inspected and determined to be undamaged and suitable for reuse.

Fall protection equipment will be used for employee safety only, not for hauling or lifting equipment.

1.8 SPECIALIZED SAFETY EQUIPMENT

Specialized safety equipment includes items such as welding shields or extraction/rescue equipment for use in confined space entry operations. Performance specifications for this equipment are provided in task-specific EH&S documentation for the work operations.

2.0 MINIMUM PROTECTIVE EQUIPMENT REQUIREMENTS

Unless otherwise specified in task-specific guidance in the project EH&S documentation, the following protective equipment/clothing will represent the minimum acceptable for use at any Earth Tech field site:

- Hardhat
- Shirt with sleeves and long pants (shorts are unacceptable for use)
- Safety glasses
- Safety-toed boots

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3.0 PROTECTIVE EQUIPMENT PROCUREMENT AND CARE

3.1 STORAGE AND MAINTENANCE

3.1.1 Personal Items

The following PPE items will be obtained by the individual users, with costs reimbursed based on the condition and safe operating use of PPE. The employee's supervisor will approve new purchases of required PPE by the employee.

- Safety-toed boots (leather)¹
- Safety Glasses²

Employees are expected to maintain this equipment in a clean, ready-to-use condition, and to perform periodic inspections to ensure that equipment is undamaged and fully functional. Any equipment which becomes unserviceable shall be replaced by the employee, subject to reimbursement in accordance with Earth Tech's PPE Allowance criteria.

3.1.2 Individually-Issued Items

The following PPE items will be issued individually to each worker, or will be obtained by each worker at Earth Tech expense for their personal use:

- Hard hat
- Safety-toed boots (rubber)
- Air purifying respirators
- Ear Muffs/ear plugs
- Cold weather gear

Employees are expected to maintain this equipment in a clean, ready-to-use condition, and to perform periodic inspections to ensure that equipment is undamaged and fully functional. Any problems should be identified to the site safety officer immediately so that replacements can be arranged.

3.1.3 Central Issue Items

Except for personal issue items, all other PPE will be stored on site and issued to workers as required for use. This includes:

- Work coveralls
- Chemically-protective outer coveralls
- Leather and chemically-protective gloves
- Face shields
- Fall protection equipment

¹ Earth Tech has established a boot purchase program with RED WING Shoes that provides for a 15% price discount and company-direct billing up to a total cost of \$100. Information about this program can be found on the EH&S website at <http://corp.earthtech.com/healthsafety/hsforms.htm>

² Earth Tech has established a prescription safety eyewear program with Wal-Mart that provides for a price discount and company-direct billing up of approved eyewear frames and lenses. Information about this program can be found on the EH&S website at <http://corp.earthtech.com/healthsafety/hsforms.htm>

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- Specialized safety equipment

All central issue equipment will be maintained in a clean, dry condition.

3.2 INSPECTION

Prior to use of any safety equipment (individual issue or centrally stored) personnel should inspect each piece to ensure that it is in good working order. Equipment exhibiting any signs of wear or damage will be immediately placed out of service and repaired/replaced.

REFERENCES: None

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HAZARD COMMUNICATION PROGRAM

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SUMMARY: All employees of Earth Tech and all outside contractors working for Earth Tech will be provided with information on the hazards associated with the use of chemical products in their workplace

1.0 GENERAL REQUIREMENTS

Any use of a hazardous commodity (any material or product containing a hazardous chemical, excluding site environmental contaminants) will be subject to the requirements of this Hazard Communication (HAZCOM) Program. The HAZCOM Program addresses:

- Requirements for identifying and labeling hazardous commodities
- Requirements for maintaining safety and health documentation for hazardous commodities
- Requirements for procurement of hazardous commodities
- Requirements for worker training in the use of hazardous commodities
- Requirements for subcontractor organizations on Earth Tech worksites

2.0 HAZARDOUS COMMODITY IDENTIFICATION AND LABELING

2.1 CONTAINER LABELING

Each container holding a hazardous commodity will be labeled, tagged, or marked with the following information:

1. Identity of the hazardous substance(s) contained therein; and
2. Appropriate hazard warnings - using an NFPA-type label (see below)

Labels on incoming purchased chemicals are not to be removed or defaced. Any container received without proper labeling cannot enter the site until properly labeled. Container size is not the determining factor in deciding if a label is required, ALL containers of hazardous chemicals must be labeled.

If a hazardous commodity is transferred from its original container, the receiving container must be labeled with the chemical identity and hazard warning. The only exception to this requirement involves the transfer of the commodity from a labeled container for immediate use; the term "immediate use" is intended to mean that the hazardous chemical will be exclusively under the control of and used by the person performing the transfer, and work will be completed within the current work shift. For such cases the "immediate use" container does not need to be labeled.

2.1.1 NFPA Labeling System

The National Fire Protection Association has developed a four-part, color-coded label for use with hazardous commodities. NFPA-compliant labels can be either a four-section diamond shape or a four-line label, to address the following conditions:

BLUE Section	~~~	Health Hazard Rating
RED Section	~~~	Fire Hazard Rating
YELLOW Section	~~~	Reactivity Hazard Rating
WHITE Section	~~~	Other specific hazards

Each of the three "rating" sections incorporates a numerical system for identification of the degree of hazard as follows:

- 0 - Minimal hazard
- 1 - Slight hazard

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2 - Moderate hazard

3 - Serious hazard

4 - Severe hazard

2.2 PIPE/VESSEL LABELING

For treatment systems all pipes or piping systems, and all process vessels containing hazardous commodities, must be labeled. The Project Manager (PM) or Response Manager (RM) is responsible for ensuring that this is accomplished at each project site.

3.0 HAZARDOUS COMMODITIES DOCUMENTATION

Earth Tech does not manufacture, package or distribute hazardous commodities. However, as an end user Earth Tech must maintain hazard documentation for each hazardous commodity used on each job site. This documentation will take the form of a listing of all on-site hazardous commodities, and copies of manufacturer-developed Materials Safety Data Sheets (MSDSs) for each listed item.

A MSDS shall be available for every hazardous commodity used or stored on each job site (this does not include MSDSs for known or suspected environmental contaminants, the hazards of which are addressed on project-specific EH&S documentation). Copies of all MSDSs will be maintained on-site in either a dedicated folder/binder, or as part of the project-specific EH&S documentation. All site personnel will be briefed as to the location of the MSDSs, and will have immediate access to examine any MSDS at any time during their work shift.

For on-going projects, each MSDS associated with a material no longer in use will be marked as obsolete and the date it was obsolete. At the completion of any project the accumulated MSDSs will be maintained as part of the project records. NO MSDS ASSOCIATED WITH ANY PROJECT WILL BE DESTROYED.

4.0 PROCUREMENT OF HAZARDOUS COMMODITIES

No hazardous commodity may be purchased for use on an Earth Tech-managed job site unless it:

- Is accompanied by a copy of the item's MSDS (unless already on file on the job site)
- Is packaged with proper hazardous commodity hazard warning labels affixed to each container.

All hazardous chemicals, even those purchased at local stores, must be accompanied with a MSDS. If a vendor cannot provide a MSDS at the time of procurement, the material should not be purchased.

5.0 WORKER HAZCOM TRAINING

All new personnel will be provided with information and training on the hazardous commodities in their work area at the time of their initial assignment. The information and training will include the following topics:

1. Requirements of the Federal OSHA regulation (29 CFR 1910.1200), and any applicable state or local regulations
2. Operations at the work area where hazardous commodities are present
3. The location and availability of this written HAZCOM Program document, the on-site list of hazardous commodities, and all MSDSs
4. Methods to detect the presence or release of a hazardous substance in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous substances when being released, etc.)

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- 5 The physical and health hazards of the substances in the work area, and the measures which can be taken to protect against these hazards

Training will be provided at the start of each project, upon arrival of a new employee, and on an annual basis for all long-term projects. Supplemental training will be performed for all personnel whenever a new hazardous commodity is introduced into the work area.

6.0 SUBCONTRACTOR ORGANIZATIONS

Personnel associated with Earth Tech subcontractor organizations on any job site shall be provided the same training and access to hazardous commodity information as Earth Tech personnel. Any subcontractor organization wishing to bring any hazardous commodity onto an Earth Tech-controlled work site must:

- Provide a copy of the item's Material Safety Data Sheet (MSDS) to Earth Tech for approval and filing
- Ensure that all hazardous commodities containers conform to Earth Tech's requirements for product hazard labeling

REFERENCES:

ENV 103 – *Purchasing Activities*

ENV 104 – *Subcontractor Selection*

ENV 301
HAZARDOUS WASTE OPERATIONS

Published: January 20, 2003

Revised: N/A

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SUMMARY: All hazardous waste operations (HAZWOPER) work performed or managed by Earth Tech will be performed in accordance with the following requirements, which are intended to ensure compliance with 29 CFR 1910.120 (and equivalent state regulations)

1.0 PERSONNEL QUALIFICATIONS

All personnel working at HAZWOPER sites must meet the training and medical monitoring requirements specified in 29 CFR 1910.120 (e) and (f). Also, additional training will be required based on site activities (e.g., confined space, lead in construction, OSHA 10-hour construction). These additional training requirements will be outlined in the project- or site-specific health and safety plan.

1.1 EARTH TECH PERSONNEL

Earth Tech's HAZWOPER-qualified employees will participate in the following training and medical monitoring procedures:

1.1.1 Medical Monitoring

Specific HAZWOPER medical examination protocols have been developed by Earth Tech's Corporate Medical Provider (CMP) to meet the requirements of 29 CFR 1910.120 (f). To be medically qualified to perform HAZWOPER work, personnel receive the following medical examinations:

- Initial (Baseline) Examination - The initial examination is a part of pre-employment requirements, and must be completed (with results received) prior to the employee's start of work date.
- Annual Examination - HAZWOPER-qualified employees will complete a medical examination once each year¹.
- Termination Examination - At the conclusion of employment at Earth Tech, or when re-assigned to non-HAZWOPER duties, personnel will be provided with the opportunity to receive a termination medical examination.
- Special Examinations - The EH&S Department and the CMP will jointly determine the need for special examinations due to:
 - Unusual exposure conditions.
 - In response to possible overexposures.

The CMP will determine the medical protocol elements for each of these examinations based on exposure information provided by the EH&S Department. The CMP will evaluate the results of each employee's examination, and will provide a medical clearance clearly stating medical compliance with the HAZWOPER regulatory standard (29 CFR 1910.120 (f)), and approval of the employee to perform unrestricted HAZWOPER activities. For Initial and Annual examinations, the CMP will also evaluate the employee for the use of air purifying and supplied air respiratory protection, and the written evaluation from these examinations will indicate the physician's approval/limitations on the employee's use of respiratory protection.

1.1.2 Training

All personnel assigned to work at a hazardous waste site must participate in training meeting the requirements of 29 CFR 1910.120 (e).

¹ Medical qualification expires on the anniversary date of the last examination completed, and there will be no "grace period" exemptions beyond this date without the express approval of an EH&S Manager. At the recommendation of the EH&S Department, the CMP may approve an alternate examination frequency, at periods of up to two years, in cases where the worker's exposures to environmental contaminants are infrequent and typically well below any occupational exposure limits (e.g., senior management personnel).

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- 1 Initial 40-Hour Training - Before being assigned to a HAZWOPER site all Earth Tech personnel must complete 40 hours of training meeting the requirements of 29 CFR 1910.120 (e)(3)(i). At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (40-hour HAZWOPER) and training dates. A copy of this certification must be provided to the employee's HSA. The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

Available Training Sources:

- On-site training provided by the EH&S Department
- Outsourced training providers approved by the EH&S Department

- 2 Refresher 8-Hour Training - To remain qualified to perform on-site work activities each Earth Tech employee will complete 8-hours of HAZWOPER refresher training meeting the requirements of 29 CFR 1910.120 (e)(8) at yearly intervals² following completion of Initial 40-hour training. At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (8-hour HAZWOPER Refresher) and the training date. A copy of this certification must be provided to the employee's Health and Safety Administrator (HSA). The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

Available Training Sources:

- Internet-based training approved by the EH&S Department
- On-site training provided by the EH&S Department
- Outsourced training providers approved by the EH&S Department
- Earth Tech's Take-home Refresher Training course (with EH&S Manager approval only)

- 3 Supervisor Training - Any Earth Tech employee acting in a management capacity for HAZWOPER activities (e.g., project management personnel, field managers, site safety officers, etc.) must complete 8 hours of HAZWOPER Supervisor training meeting the requirements of 29 CFR 1910.120 (e)(4). This training is required only once, no supervisor refresher training is specified (however supervisors must still maintain their overall HAZWOPER-qualification through annual completion of Refresher training). At the conclusion of training personnel will receive a written certification of course completion, signed by the instructor, which indicates the course of instruction (HAZWOPER Supervisor) and the training date. A copy of this certification must be provided to the employee's HSA. The employee is responsible for maintaining their own copy of this certificate, and bringing it when working on any HAZWOPER site.

Available Training Sources:

- On-site training provided by the EH&S Department
- Outsourced training providers approved by the EH&S Department

- 4 24-Hour HAZWOPER Training - Some site support contractors and site visitors may qualify to substitute 24-hour HAZWOPER training in place of 40-hour training, as specified in 29 CFR 1910.120 (e)(3)(ii). Personnel potentially qualifying for this alternative training include:

- Site support personnel who will not work in any Exclusion Zone areas.
- Subcontractors and site visitors who's duties will not entail significant exposure to site contaminants³.

² Training expires on the anniversary date of the last class completed. The worker's HAZWOPER-qualification expires at this time, and there will be no "grace period" exemptions beyond this date without the express approval of an EH&S Manager.

³ Defined as not working in any areas where airborne contaminant concentrations exceed one-half of any applicable occupational exposure limit, and no contact or exposure to materials with site contaminant concentrations exceeding natural background levels.

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An EH&S Manager must approve of the substitution of 24-hour training for Initial 40-hour training. Persons qualifying for 24-hour training must provide written certification of course completion prior to beginning work on site. Persons completing 24-hour training must complete 8 hours of annual refresher training at the required interval to maintain eligibility for on-site work, and must provide proof of this training (as necessary to demonstrate re-training) prior to beginning work on site.

1.2 SUBCONTRACTOR PERSONNEL

Any subcontractor organization whose employees will support Earth Tech operations at a HAZWOPER site will:

- Provide the Earth Tech Project Manager with a copy of their written HAZWOPER medical monitoring and training program requirements. The elements of the program must be similar to those for Earth Tech's own program, as detailed above.
- Provide the Project Manager with written certification of a physician's approved medical clearance for each employee who will work on the site. Certification can be demonstrated by:
 - A copy of the physician's signed medical clearance for each employee (preferred), or
 - A letter identifying the medical status and clearance expiration date of every employee, signed by the company's safety director or an officer of the company
- A copy of the each employee's training certifications, which must include:
 - The Initial 40-hour training certificate (24-hour training may be substituted with EH&S Department approval).
 - The most current Refresher training certificate (must be current within the previous 1-year period)
 - A copy of the Supervisor training certificate for each person serving in a management capacity (e.g., foreman personnel)

2.0 PROJECT EH&S DOCUMENTATION – HEALTH AND SAFETY PLANS

The project EH&S documentation prepared for HAZWOPER activities is referred to as a Health and Safety Plan (HASP), and must meet the requirements presented in 29 CFR 1910.120 (b)(4). The required plan elements include:

1. A description of the work location, the site history, and a summary of any information available concerning site hazards (including both physical hazards and contamination conditions).
2. A summary of the work activities to be performed under Earth Tech's scope of activities.
3. A safety and health risk or hazard analysis for each on-site task which will be performed. Identified risks must include both chemical and physical hazards to which personnel may be exposed during the conduct of the work task.
4. Protective measures for each work task to prevent or mitigate the potential hazards identified in the hazard analyses.
5. Personal protective equipment (PPE) requirements for each work task.
6. Frequency and types of air monitoring, personal monitoring, and environmental sampling techniques and instrumentation to be used.
7. Site control measures.
8. Decontamination procedures.
9. An emergency response plan addressing actions to be taken in the event of each type of credible incident which might result during the performance of planned work activities, including minor and major injuries.

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and chemical release and fire. Response plans must address the means for coordinating the evacuation of all on-site personnel in the event of a catastrophic incident.

Responsibility for development of each HASP will be coordinated between the Project Manager and the EH&S Department as part of project initiation. Regardless of where the HASP is developed, it will be reviewed and approved by the EH&S Department prior to submission to any agency outside of Earth Tech.

3.0 HAZWOPER PROTECTIVE EQUIPMENT ENSEMBLES

Defined HAZWOPER PPE ensembles are specified for general use on all HAZWOPER operations. The project HASP may specify modifications to these requirements to meet specific on-site conditions.

3.1 LEVEL D ENSEMBLE

The Level D ensemble provides a minimal level of skin protection (primarily against physical rather than chemical hazards) and no respiratory protection. Level D PPE is the minimum work uniform which will be used on HAZWOPER sites. Its use is appropriate when there is no significant potential for encountering chemical materials while working in controlled work areas.

Level D Equipment List

- Hard hat
- Eye protection
- Safety-toe work boots
- Hearing protection (as required).

3.2 MODIFIED LEVEL D ENSEMBLE

The Modified Level D ensemble provides moderate skin protection against chemical contact, but no respiratory protection. Its use is appropriate where there is a moderate to low potential for skin contact with chemical materials, but no significant inhalation hazard is expected. The Modified Level D ensemble will consist of the Level D ensemble, supplemented by the addition of one or more of the following items:

- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer gloves (taped to outer coveralls)⁴
- Chemical-resistant inner gloves⁴
- Chemical-resistant safety-toe boots (taped to outer coveralls)

3.3 LEVEL C ENSEMBLE

The Level C ensemble provides moderate skin protection against chemical contact and moderate respiratory protection. Its use is appropriate where there is the potential for skin contact with chemical materials, together with a limited and well defined potential for exposure via inhalation.

⁴ Selection of specific glove types/materials will be provided in the project HASP based consideration of the contaminants and the physical conditions of the work.

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Level C Equipment List

- Full-face air-purifying respirator equipped with HASP-designated cartridges⁵
- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer glove (taped to outer coveralls)⁴
- Chemical-resistant inner gloves⁴
- Hard hat
- Safety-toe boots (taped to coveralls) the use of boot covers or chemical-resistant boot may be specified
- Hearing protection (as required)

3.4 LEVEL B ENSEMBLE

The Level B ensemble provides both the highest level of inhalation exposure protection, and considerable skin contact protection. It's use is appropriate where there are significant chemical hazards involving both skin and inhalation exposure (up to and including IDLH conditions), or where adverse atmospheric conditions cannot be mitigated by use of air purifying respirators (e.g., oxygen deficient atmospheres, chemicals with poor warning properties)

Level B Equipment List

- Supplied air respirator (either SCBA or air line system w/Grade D or better breathing air)
- Chemical-resistant disposable outer coveralls
- Chemical-resistant outer glove (taped to outer coveralls)⁴
- Chemical-resistant inner gloves⁴
- Hard hat
- Chemical resistant safety-toe boots (taped to coveralls)
- Hearing protection (as required)

3.5 LEVEL A ENSEMBLE

The Level A ensemble provides the highest level of both respiratory and skin protection, up to and including protection against skin contact with vapor-phase contaminants. The use of Level A PPE requires approval from the GWES EH&S Director

Specific Level A ensemble components will be determined on a case-by-case basis by the EH&S Department

4.0 EXPOSURE MONITORING

Air monitoring at HAZWOPER sites will be conducted to monitor and control employee exposures to chemical contaminants, and to regulate controlled work area boundaries for the protection of non-HAZWOPER workers and the general public.

⁵ Selection of specific cartridges will be made by the EH&S Department based on contaminants present. A cartridge change-out frequency will also be specified in the HASP based on manufacturer's cartridge performance data.

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4.1 DIRECT READING AIR MONITORING REQUIREMENTS

Airborne contaminants present potential hazards to HAZWOPER personnel working within controlled work areas, and to non-HAZWOPER workers and the general public present outside the controlled areas. On site monitoring will be utilized to assess the magnitude of these hazards, and provide indications of any necessary control procedures to mitigate unacceptable hazards.

Specific air monitoring requirements will be established in individual Health and Safety Plans (HASPs) subject to the following requirements:

- Direct reading instrumentation will be used when available. Instruments include:
 - Flame Ionization Detectors (FIDs – e.g., OVA) – select organic vapors
 - Photoionization detectors (PID – e.g., miniRAE or Micro-TIP) – select organic vapors
 - Explosimeters – explosivity (as a percent of the Lower Explosive Limit)
 - Oxygen monitors – oxygen concentration (in percent)
 - Single gas meters (mono-tox) – selected contaminants (in parts per million)
 - Hydrogen sulfide
 - Carbon monoxide
 - Oxides of Nitrogen
 - Cyanide
 - Colorimetric Detector Tubes (e.g., Draegar) – selected contaminants (in parts per million)
 - Aerosol monitors (e.g., mini-RAM) – airborne particulate concentration (in milligrams per cubic meter)
 - Portable gas chromatographs (e.g., OVA) – selected organic vapors

Selected instruments will be capable of discriminating contaminant concentrations to concentrations of at least one-half of the HASP-specified exposure limit. All direct reading instrumentation will be calibrated daily as directed by the manufacturer.

4.1.1 Work Area Monitoring

1. Work area monitoring will include breathing zone readings for the maximally exposed worker(s)
2. Results will be used to determine adequacy of PPE (especially respiratory protection). Specific criteria for upgrade/downgrade will be established in the HASP.

4.1.2 Perimeter Air Monitoring

1. Perimeter air samples will be collected when the potential exists for airborne contaminants to migrate off-site
2. Perimeter monitoring will be conducted at locations downwind from the project activities at a minimum.
3. Results will be used to determine if the existing controlled work area boundaries are adequate, and/or if work operations present unwarranted hazards to off-site personnel.

4.2 PERSONAL EXPOSURE MONITORING

Personal exposure monitoring will be conducted to determine individual exposures, as specified in the HASP or directed by the EH&S Department

- Sample results will be recorded in a log book or on the sample log form provided in Attachment 2.
- Records will indicate individual name, SSN, and job/operation at the time of sample collection

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- Samples sent out for independent laboratory analysis will follow chain of custody requirements
- Exposure results will be posted on site and explained in a safety briefing.
- Employees will receive a written statement of results within 5 days of receipt from the laboratory

Results of all personal exposure monitoring will be provided to the EH&S Department for inclusion in the employee medical records

REFERENCES:

ENV 003 – *EH&S Administrative Support*
ENV 203 – *Medical Monitoring Program*

ATTACHMENT:

Attachment 1 – *Direct Reading Instrument Monitoring Log*
Attachment 2 – *Personal Sampling Data Sheet*
Attachment 3 – *Instrument Calibration Log*

DIRECT READING INSTRUMENT MONITORING LOG

Project: _____

Job No.: _____

Date: _____

Operator: _____

Instrument: _____

Calibration: _____

(Amt, Component, Date)

Sampling Technique: _____

Sample Interval: _____

Background Reading: _____

Action Level/Response: _____

[illegible]

Client: _____

Site Location: _____

Material: _____

Job No.: _____

Sampling Media: _____

[illegible]

Instrument Information	
Instrument Name: _____	Manufacturer: _____
Serial Number: _____	Last Service Date: _____
Parameter(s): _____	Calibration Gas: _____
Calibration Procedure:	
Daily Calibration Results	
Date: _____	Calibration Result: _____
Name: _____	Signature: _____
Notes:	
Date: _____	Calibration Result: _____
Name: _____	Signature: _____
Notes:	
Date: _____	Calibration Result: _____
Name: _____	Signature: _____
Notes:	
Date: _____	Calibration Result: _____
Name: _____	Signature: _____
Notes:	
Date: _____	Calibration Result: _____
Name: _____	Signature: _____
Notes:	
Date: _____	Calibration Result: _____
Name: _____	Signature: _____
Notes:	
Date: _____	Calibration Result: _____
Name: _____	Signature: _____
Notes:	

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MANUAL MATERIALS HANDLING

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SUMMARY: Earth Tech personnel will observe the procedures below when performing manual handling in excess of 10 pounds. No person shall lift more than 49 pounds without the use of mechanical aid or assistance from other personnel.

1.0 INTRODUCTION

Manual materials handling (MMH) means moving or handling things by lifting, lowering, pushing, pulling, carrying, holding, or restraining. Improper MMH can result in cuts, pinches, crushing, and serious back, abdomen, arm, and leg muscle and joint injury. Even "light" objects, lifted improperly, can contribute to injury, causing cuts and muscle injuries.

The level of hazard associated with MMH work depends on what is being handled, what the task is, and what the conditions are at the workplace. Specific considerations include:

- Is the load too heavy for the task that you are doing?
- Is the load located too high or low for a safe lift?
- Is the load too big or may have a shape that makes it difficult to handle?
- Is the load wet, slippery, or have sharp edges that make it difficult to grasp?
- Is the load unstable or can shift its center of gravity because contains items that can move or flow (e.g., a partially filled drum or concrete in a wheelbarrow)?
- Is the load too big to let you see where you are putting your feet?

The task can make MMH hazardous if a worker:

- Uses poor lifting techniques (lifting too fast, too often or too long; lifting with back bent or while twisting or reaching too far; lifting while sitting or kneeling, etc.),
- Has to move material over long distances,
- Does not take appropriate rest breaks; insufficient recovery time, and
- Performs a combination of different handling tasks together (e.g. lifting, carrying and lowering).

The site conditions can also contribute to hazards of MMH if:

- Walking surfaces are uneven, sloping, wet, icy, slippery, unsteady, etc
- There are differences in floor levels or walking surfaces.
- There is poor housekeeping that causes slip, trip and fall hazards
- There is inadequate lighting.
- Work is performed at a fast pace
- Movement is restricted because of clothing or personal protective equipment, or because the space is small or posture is constrained

2.0 GENERAL REQUIREMENTS

Mechanical equipment or assistance such as dollies, carts, come-alongs, or rollers are to be used whenever possible. Mechanical assistance must be of proper size, have wheels sized for the terrain, and be designed to prevent pinching or undue stress on wrists. Objects to be moved must be secured to prevent falling and properly balanced to prevent tipping.

The following guidance will be observed:

1 Before performing the lift:

- a Check to see if mechanical aids such as hoists, lift trucks dollies or wheelbarrows are available.

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- b Be sure that you can lift the load without over-exertion, and get help with heavy or awkward loads. All loads in excess of 49 pounds require use of mechanical aids or assistance from other personnel.
 - c Be sure that the load is "free" to move.
 - d Check that the planned location of the load is free of obstacles and debris.
 - e Be sure that the path to the planned location of the load is clear. Grease, oil, water, litter and debris can cause slips and falls.
 - f Particular handling and lifting techniques are needed for different kinds of loads or materials being handled (for example, compact loads, small bags, large sacks, drums, barrels, cylinders, sheet materials like metal or glass). See Section 2.0 for additional guidance.
 - g Do not lift if you are not sure that you can handle the load safely.
- 2 General tips for lifting:
- a Prepare for the lift by warming up the muscles.
 - b Stand close to the load and face the way you intend to move.
 - c Use a wide stance to gain balance.
 - d Be sure you have a good grip on the load.
 - e Keep arms straight.
 - f Tighten abdominal muscles.
 - g Tuck chin into the chest.
 - h Initiate the lift with body weight.
 - i Lift the load as close to the body as possible.
 - j Lift smoothly without jerking.
 - k Avoid twisting and side bending while lifting.
- 3 Engineering Controls:
- a Material handling tasks should be designed to minimize the weight, range of motion, and frequency of the activity.
 - b Alter the task to eliminate the hazardous motion and/or change the position of the object in relation to the employee's body -- such as adjusting the height of a pallet or shelf.
 - c Work methods and stations should be designed to minimize the distance between the person and the object being handled.
 - d High-strength push-pull requirements are undesirable, but pushing is better than pulling. Material handling equipment should be easy to move, with handles that can be easily grasped in an upright posture.
 - e Workbench or workstation configurations can force people to bend over. Corrections should emphasize adjustments necessary for the employee to remain in a relaxed upright stance or fully supported, seated posture. Bending the upper body and spine to reach into a bin or container is highly undesirable. The bins should be elevated, tilted or equipped with collapsible sides to improve access.
 - f Repetitive or sustained twisting, stretching, or leaning to one side are undesirable. Corrections could include repositioning bins and moving employees closer to parts and conveyors.
 - g Store heavy objects at waist level.
- 4 Whenever possible, utilize hand holds or other lifting attachments on objects being handled:
- a Use the "hook grip" on loads with cut-out handholds.
 - b Curl your fingers around the edge.

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- c Do not hold the load with fingertips
- d Use containers with handles located more than halfway up the side of the container.
- e Use the "ledge grip" to handle regularly shaped objects without handles
- f Use vacuum lifters to handle sheet materials or plates
- g Hold the object with hands placed diagonally
- h Wear gloves where practical

5. When significant, sustained lifting work is required it is desirable to rotate employees to spread the work load among several people and avoid fatigue. Rotation is not simply performing a different job, but must be a job that utilizes a completely different muscle group from the ones that have been over-exerted

3.0 SPECIFIC HANDLING TECHNIQUES

The following guidance will be used when performing MMH for various types of materials.

3.1 SQUARE OR RECTANGULAR OBJECTS

To lift square or rectangular objects:

- Place one foot slightly in front of the other.
- Squat as close to the object as possible
- Grasp one of the top corners away from the body and the opposite bottom corner closest to the body
- Tilt the object slightly away from the body, tilt forward at the hips, keep the back straight, and tuck in the chin
- Test to be sure the object is loose from floor and shall lift without snagging.
- Straighten the legs, keeping the backbone straight, pull the object into the body, and stand up slowly and evenly without jerking or twisting.
- If turning or change of direction is required, turn with feet without twisting the torso and step in the direction to travel
- To set an object down, reverse the sequence, being sure not to trap the bottom hand between the object and the surface on which the object is set

3.2 CYLINDRICAL OBJECTS

When lifting/moving round or cylindrical objects, the objects should be rolled wherever possible. Rolling must be controlled by chute, tagline, or other means of limiting acceleration. Workers must not be positioned downhill from rolled objects. Use of the legs for pushing and tagline control of rolled objects must be stressed.

Cylindrical objects, such as drums that must remain upright, are to be handled manually by slightly tilting the object, using the legs for control, and balancing the object on the bottom edge. The handler then walks besides the object, with the object tilted toward the body, positioning the hands on the top edge away from the body and moving so they do not cross, thus, maintaining the balance and a steady controlled forward motion. Motion must be controlled so that stopping walking and moving the hands shall stop forward motion.

Use carts or tracks to transport cylinders. Make sure that two people transport a cylinder if carts cannot be used, use lifting straps to improve grip.

Technique for one person lifting a cylinder onto a platform:

- 1 Roll the cylinder to within 3 feet of the platform.

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- 2 Position the forward foot around the cylinder, the back foot about 1 foot behind the cylinder
- 3 Bend knees slightly
- 4 Place one hand on the valve protective cap, the other hand underneath the cylinder about 1 foot from the ground
- 5 Tilt the cylinder onto the thigh of the back leg
- 6 Balance the cylinder on the thigh by pressing down with the back hand while lifting the cylinder with the forward hand.
- 7 Extend both knees to initiate and forward movement of the cylinder and continue by pushing up and forward with the arms until the cylinder is located on the platform
- 8 Climb on the platform
- 9 Straddle the cylinder at the valve end
- 10 Grasp the valve protective cap of the cylinder with both hands between the thighs.
- 11 Lean forward and straighten the knees to set the cylinder upright.

3.3 BAGS AND SACKS

The best way to handle a bag depends on its size, weight and how far it is to be carried. When lifting, remember to:

- Straddle the end of the bag.
- Bend the hips and knees
- Keep the back straight
- Grasp the bag with both hands under the closer end. Keep elbows inside the thighs
- Lean forward, straightening the knees to set the bag upright.
- Readjust the straddle position moving feet closer to the bag.
- Readjust the grasp, with one hand clasping the bag against the body and the other under it
- Stand up by thrusting off with the back leg and continuing in an upward and forward direction.
- Thrust the bag up with the knee while straightening the body.
- Put the bag on the shoulder opposite the knee used to thrust the bag up
- Stabilize the bag on the shoulder.
- Move off without bending sideways.

Avoid unloading a bag from the shoulder directly to floor level. Use an intermediate platform or get help from a coworker.

1. Stand close to the platform.
2. Place one foot in front of the platform.
3. Bend hips and knees.
4. Keep the back straight.
5. Ease the bag off the shoulder and put it upright on the platform.
6. Pull the bag slightly over the edge of the platform.
7. Stand close to the platform with the bag touching the chest.
8. Clasp the bag against the body with one hand, the other hand holding bottom of the bag.
9. Step back
10. Bend hips and knees, keeping back straight
11. Ease the bag on the floor

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Bulkier sacks are easier to carry on your back. Lift the sack onto your back from a platform:

1. Move the sack to the edge of the platform
2. Put your back against the sack.
3. Grasp with both hands on the upper corners of the sack
4. Ease the sack onto the back, bending hips and knees before taking the weight
5. Keep the back straight.
6. Stand up and straighten the hips and knees.
7. Stabilize the sack.
8. Move away without bending sideways

Two-person handling of a sack:

1. Position one person on either side of the sack.
2. Squat with one foot balancing behind the sack
3. Keep back straight
4. Grasp with the outer and on the upper corner, the other holding the bottom of the sack.
5. On one person's command:
 - a. Stand up and straighten the hips and knees
 - b. Move towards the stack.
 - c. Put the sack on the stack

3.4 SHEET MATERIALS

When lifting sheet materials:

1. Stand close to the pile of sheets in a walking stance
2. Grasp sheet firmly at the mid-point of its long side with the closer hand
3. Pull sheet up and toward the body.
4. Change grip using your other hand and put your fingers on top of the sheet
5. Pull sheet up to the vertical position and to the side until one half is off the pile
6. Grasp the lower edge of the sheet with the free hand and support the hand by placing it on your knee
7. Stand up without bending and twisting body

To carry sheets:

- Use drywall carts to carry sheet materials
- Get help from another person where carts are not available
- Apply carrying handles for manual carrying
- Always use gloves and carrying handle for glass and other materials with sharp edges

Team Handling - Team handling occurs when more than one person is involved during the lift. Use team lifting and carrying where other solutions are inappropriate

- Remember that the combined strength of the team is less than the sum of individual strength
- Select team members of similar height and strength.
- Assign a leader to the team.
- Determine a set of commands to be used such as "lift", "walk", "stop", "down". Make sure that everyone knows what to do when they hear the command
- Follow the commands given by the team leader.

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- Practice team lifting and carrying together before attempting the task

4.0 MATERIALS STORAGE

When storing materials on site

- Store materials at a convenient height
- Leave the lowest shelf unused if necessary.
- Use vertically mobile shelves to avoid bending and overhead reaching
- Use bin racks for storing small items.
- Store heavy and frequently used materials at waist height.
- Do not store materials at floor level
- Use hand trucks with elevating devices in storage and loading areas
- Use trucks with a tilting device to avoid bending.
- Use elevating platforms to avoid overhead reaching

REFERENCES:

ENV 507 - *Handling of Drums and Large Containers*
ENV 522 - *Working Surfaces*

ENV 507
HANDLING OF DRUMS AND LARGE CONTAINERS

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SUMMARY: This procedure provides guidance to employees and managers to minimize injuries, exposures, environmental contamination, and work disruptions resulting from accidents or injuries that could be caused by improper handling of drums and other containers

1.0 GENERAL REQUIREMENTS

These requirements apply to drums of 10-gallon capacity and larger, and to other portable atmospheric containers of 10-gallon capacity or larger. The requirements of this procedure are not applicable to the handling of containers used to store pressurized gases or to hazardous waste drum handling

1.1 DEFINITIONS

The following definitions apply to these procedures and are slightly modified for specific operations

Drums - Hollow, cylindrical containers (capacity between 10 and 55 gallons) used for the storage or containerization of bulk quantities of work materials or wastes.

Other Large Containers - Containers other than drums that are used to hold bulk quantities of work materials or wastes. These include tanks and roll-off bins, and are generally much larger than drums

Tanks - Hollow containers of capacity greater than 55 gallons used for the storage or containerization of bulk liquids.

Roll-off Bins - Rectangular-shaped containers capable of being transported using a specially designed vehicle on which the roll-off bin can be mounted/dismounted. Roll-off bins can be placed at a site, used to containerize bulk materials, and re-mounted on the vehicle for off-site transportation. Some roll-off bins are equipped with wheels, and can be moved manually.

2.0 PROCEDURES

2.1 GENERAL

All storage and handling of drums and other containers will conform to the following handling requirements

- No drum or container will be filled beyond its rated capacity (expressed as either weight or volume) For liquid-containing drums/containers, a void space must be left to allow for liquid expansion in extreme heat.
- Storage locations for drums/containers shall be segregated so that differing types of materials are not stored together or co-mingled. Chemical products and waste materials shall not be stored together. Incompatible materials (e.g., fuels and oxidizers) shall not be stored together.
- Any drum/container storage structure must have the capability to fully contain a spill consisting of the contents of the largest container permitted for use in the structure plus the volume of water expected to be generated by a 25-year storm. The storage area shall be fenced and locked, and access will be limited to designated personnel.
- In accordance with the requirements of 29 CFR 1910.1200 (Hazard Communication), all drums and other containers will be labeled as to their contents. Hazardous properties such as flammability, etc., shall also be clearly indicated. For containers of hazardous wastes, the date on which waste was first accumulated in the drum/container shall be noted.

2.2 DRUMS

In addition to the above requirements, handling of all drums will be accomplished in accordance with the following:

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- Only drums meeting U.S. Department of Transportation (DOT) specifications shall be used. Drums shall be inspected for rust, corrosion, warping, and other damage. Damaged drums shall not be used.
- Drums containing any materials will be covered with a tight-fitting lid when not in use.
- At the conclusion of each working shift, all drums will be placed in the designated storage area appropriate to their contents. Each such area will be properly marked and secured.
- Drums containing hazardous or flammable materials will be electrically grounded to prevent the buildup of static charge. As required, containers will be bonded to ensure that no potential charge difference exists between containers that might come into contact and cause sparking.
- Manual lifting, carrying, or moving of drums will not be permitted. A drum-handling cart or similar apparatus will be used for moving drums from collection points to the designated storage area.

2.3 OTHER CONTAINERS

- Each container shall be inspected for rust, corrosion, warping, and other damage prior to use. Damaged containers shall not be used.
- Containers larger than 55 gallons and/or 800 pounds will not be moved using any type of manual method, including non-powered mechanical devices. All handling will be accomplished using powered mechanical equipment designed specifically for that purpose.
- As applicable, any container holding material shall be covered with a tight-fitting lid when not in use.
- Containers of hazardous or flammable materials will be electrically grounded to prevent the buildup of static charge. As required, containers will be bonded to ensure that no potential charge difference exists between containers that might come into contact and cause sparking.

3.0 DRUM HANDLING PROCEDURE

Use mechanical aids whenever possible. Do not attempt to raise a full drum alone.

Moving an upright drum:

1. Stand close to the drum with feet apart. One foot at the front and the other behind.
2. Keep knees slightly flexed.
3. Put your hands firmly against upper rim of the drum.
4. Keep arms straight with the elbows "locked".
5. Rock the drum gently to get the feel of its contents before you move it.
6. Push the top of the drum away by extending the back leg and shifting your body weight onto your front leg.
7. Stop tilting the drum at the balance point. Use back leg as a counter balance.

Raising a drum laid on its side:

1. Make sure that the drum is empty before raising it.
2. Stand at the end of the drum.
3. Place one foot forward at the side of the drum, the other behind.
4. Bend your hips and knees.
5. Keep the back straight.
6. Grasp the rim about 15 cm from the ground with the elbows inside thighs.



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- 7 Stand up by thrusting off with the back leg and continuing in an upward and forward direction.
- 8 Bring the back leg forward as if you are walking. Keep close to the drum
- 9 Stop at the balance point to change hand grip.
10. Set the drum on its base by moving back leg forward. Use the body weight as a counter balance

REFERENCES:ENV 501 – *Manual Materials Handling*ENV 508 – *Drum Sampling*

ENV 515
EXCAVATION

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SUMMARY: Earth Tech will evaluate all excavation operations to provide for proper protective systems and ensure employee protection from excavation collapse. In addition, Earth Tech will comply with the guidelines found in 29 CFR Subpart P, 1926.650 through 1926.652, as well as any state or local regulations.

1.0 GENERAL REQUIREMENTS

The following factors are to be evaluated by a competent person and discussed before commencing excavation operations:

Soil Structure: Excavations in wet soil, sandy soil, or areas that have been backfilled are relatively unstable and must be supported or sloped if employees are to enter the excavation.

Weather Conditions: Changing weather conditions greatly affect the safety of working in and around excavations. Excess water from rain or snow loosens the soil, increasing the chance of the soil caving in. Excavation should be diked, pumped, or covered, to prevent an excessive amount of water from accumulating.

Superimposed Loads: Superimposed loads in the vicinity of excavation walls increase the probability of a cave-in. Heavy equipment and materials should be kept back as far as possible. Heavy equipment should be placed on wooden mats or planking to spread the weight more evenly. Considerations must also be taken when buildings, curbs, trees, utility poles, and other structures are around the excavation. Excavated soil must be stored away from the edge of the excavation.

2.0 SPECIFIC REQUIREMENTS

The following safe operating guidelines will apply to excavations exceeding 4 feet in depth:

- Prior to opening an excavation, all efforts shall be made to locate all underground utilities. The utilities shall be marked.
- Trees, boulders, and other surface encumbrances that create a hazard will be removed or made safe before excavation is begun.
- Excavated materials will be stored and retained at least 3 feet from the edge of the excavation. Walkways and sidewalks shall be kept clear of excavated materials.
- Special precautions will be taken in sloping or shoring the sides of excavations adjacent to a previously backfilled excavation.
- Except in hard rock, excavations below the level of the base of the footing of any foundation or retaining wall will not be permitted unless the wall is underpinned and all other precautions have been taken to ensure the stability of the adjacent walls.
- Diversion ditches, dikes or other suitable means will be used to prevent water from entering an excavation and for drainage of the excavation.
- When mobile equipment is used or allowed adjacent to excavations, stop logs or barricades will be installed. The grade will always be away from the excavation.
- Dust conditions during excavation will be kept to a minimum. Wetting agents shall be used upon the direction of the SSO.
- Employees subjected to vehicle traffic in excavating operations shall don reflective clothing.
- Excavations shall be inspected by a competent person prior to employees entering the space (see Section 5.0).

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- When employees are required to work in an excavation 4 feet or deeper, one or more ladders shall be provided for access/egress. Within the trench, the maximum horizontal travel distance to a ladder shall be no more than 25 feet. The ladder shall extend a minimum of 3 feet above the excavation and be secured. This ladder shall not be removed until all employees have exited the excavation. All ladders will meet the requirements of 29 CFR 1910.25.
- Excavations deeper than 5 feet which are entered by employees shall be sloped, shored, or supported by some other protective system prior to entering the space.
- Guardrail or fences shall be placed at all excavations which are close to sidewalks, drives, or other thoroughfares. Adequate protection shall also exist at remote excavations where workers are not present.

3.0 PROTECTIVE SYSTEMS

OSHA requires that all excavations more than 5 feet deep which will be entered by employees shall be shored, sheeted, braced, or supported

- The preferred method is to slope the sides of the excavation to the angle of repose, or the angle of control at which the soil will remain at rest. The angle of repose varies with different kinds of soil; this angle must be determined on each individual excavation, using the following guidelines:

Maximum Allowable Slopes

Soil or Rock Type	Horizontal to Vertical Ratio (Slope)
Stable Rock	Vertical (90 degrees)
Type A	¾:1 (53 degrees)
Type B	1:1 (45 degrees)
Type C	1½:1 (34 degrees)

Note: No soil classification is required if a 1½:1 slope (34-degree slope) is used. If a 1½:1 slope is not used, a soil classification must be made by a competent person. The excavation must then comply with the above minimum slope requirements.

- The second method of support is shoring, sheeting, tightly placed timber shores, bracing, trench jacks, piles, or other materials installed in a manner strong enough to resist the pressures surrounding the excavations.
- The third method is to use a trench box, which is a prefabricated movable trench shield made of steel plates, welded to a steel frame.

4.0 HAZARDOUS ATMOSPHERES

When Earth Tech performs excavation operations in areas where a hazardous atmosphere could reasonably exist (e.g., landfill, hazardous storage areas, underground/aboveground storage tanks, etc.) personnel will, at a minimum, apply these guidelines:

- Perform atmospheric testing in the anticipated breathing zone of the work area to determine oxygen content, combustible gas, and toxic gases and vapors, if applicable.
- Employees will not perform work in areas with less than 19.5% oxygen without the appropriate respiratory protection or adequate ventilation.
- Employees will not perform work in an area with more than a 10% lower explosive level (LEL).

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EXCAVATION**

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- Toxic gases will be evaluated on a per-site basis using direct-reading equipment

5.0 COMPETENT PERSON

The SSO or designated alternate will serve as the site's "competent person" for excavation operations. The designated competent person must meet the following qualifications:

- Has sufficient experience to identify existing and predictable hazards in the excavation surroundings, or working conditions which are unsanitary, hazardous or dangerous to employees, and
- Is a registered Professional Engineer (P E) in civil engineering, or
- Has completed a minimum of 6 hours of training in excavation safety which includes the following elements:
 - Soils classification and identification
 - Appropriate sloping/shoring methods
 - Shoring system types and construction
 - Operational safety practices
 - Inspection of excavations

The designated competent person will be responsible for:

- 1 Performing a daily inspection of the excavation (to be documented on the *Excavation Daily Inspection Checklist* form [Attachment 1].
- 2 Overseeing excavation operations to ensure that they conform to the requirements of 29 CFR Subpart P, and the following operational safety guidelines in Section 2 0.

REFERENCES: None

ATTACHMENTS: Attachment 1 – *Excavation Daily Inspection Checklist*

EARTH TECH EXCAVATION DAILY INSPECTION CHECKLIST

Project Name: _____

Project/Contract Number: _____

Project Manager: _____

Site Safety Coordinator: _____

Competent Person: _____

TRENCHING/EXCAVATION INSPECTION REQUIREMENTS

Visual Test:

- ☐ Cohesive
☐ Granular
☐ Fissured

Manual Test:

- ☐ Cohesive
☐ Granular

Soil Classification:

- ☐ Stable Rock
☐ Class A

- ☐ Class B
☐ Class C

Protective Measures/Equipment:

- ☐ Slope 1 ½H:1V Type C
☐ Slope 1H:1V Type B
☐ Slope ¾ H:1V Type A
☐ Special Engineered Design (submit copy to EH&S Department)
☐ Horizontal
☐ Vertical

- ☐ Trench Shoring Box
☐ Manufacturer's Tabulated Data
☐ Correct Shore/Shield
☐ Slope Used _____

Encumbrances Identified:

- ☐ Above Ground (explain): _____
☐ Below Ground (explain): _____
☐ Surcharge Loads (explain): _____

General Considerations:

- ☐ Ladder/Ramps
☐ Hazardous Atmosphere
☐ Spoil Material Placement
☐ Water Accumulation

☐ Utility Locations

☐ Other: _____
☐ Notes: _____

1. Has the daily inspection of the excavation site been made by the competent person? ☐ yes ☐ no ☐ n/a
2. Are employees who are exposed to vehicular traffic wearing warning vests? ☐ yes ☐ no ☐ n/a
3. Are employees being kept out from under suspended loads? ☐ yes ☐ no ☐ n/a
4. Before opening any excavation, have efforts been made to determine if there are underground utility installation in the area? ☐ yes ☐ no ☐ n/a
5. If there are underground utility installations, have utility companies been contacted before excavation was started? ☐ yes ☐ no ☐ n/a
6. If underground utility installations are located, have they been protected, braced or removed to safeguard employees? ☐ yes ☐ no ☐ n/a
7. Have all surface encumbrances been removed? ☐ yes ☐ no ☐ n/a
8. In excavations employees are required to enter, have excavated or other materials been effectively stored and retained at least 2 feet from the edge of the excavation? ☐ yes ☐ no ☐ n/a
9. Do trenches >4 feet deep or more have adequate means of exit: ladders or steps? (no more than 25 feet of travel is required) ☐ yes ☐ no ☐ n/a
10. Have steps been taken to protect employees from loose rock and hazards of falling rock? ☐ yes ☐ no ☐ n/a
11. Do the walls and faces of trenches 5 feet or deeper and *all* excavations in which employees are exposed to danger from moving ground or a cave-in have a protection system, i.e. Shoring, sloping or some other equivalent means? ☐ yes ☐ no ☐ n/a
12. Is there any evidence of a possible cave-in or slide?
If yes, all work in the excavation must cease until the necessary precautions have been taken to safeguard the employees. ☐ yes ☐ no ☐ n/a
13. Have guardrails been provided when employees are required to cross a walkway at an excavation site? ☐ yes ☐ no ☐ n/a
14. If excavation is remote, such as a well, pit or shaft, have physical barriers been provided? ☐ yes ☐ no ☐ n/a
15. Have structural ramps used solely by employees been designed by a competent person? ☐ yes ☐ no ☐ n/a
16. Do the structural ramps have appropriate means provided to prevent slipping and are the runways uniform in thickness? ☐ yes ☐ no ☐ n/a
17. Has a barricade, stop log or hand signal been provided when equipment is required close to the excavation? ☐ yes ☐ no ☐ n/a
18. Are sidewalks, pavements, etc. Protected from undercuts? ☐ yes ☐ no ☐ n/a
19. Have adjoining buildings, walls, etc. been braced or otherwise supported? ☐ yes ☐ no ☐ n/a
20. Has the air around the excavation site been tested to make sure an oxygen deficiency or hazardous atmosphere does not exist? ☐ yes ☐ no ☐ n/a
21. If hazardous atmosphere does exist, has proper personal protective equipment been provided? ☐ yes ☐ no ☐ n/a
22. Is water accumulation a problem? ☐ yes ☐ no ☐ n/a if yes are employees in the excavation site protected and equipment monitored by a competent person? ☐ yes ☐ no ☐ n/a

Completed By: _____

Print Name _____

Signature _____

Organization _____

Date _____

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SUMMARY: Field supervisors are responsible for protecting their workers from heat stress conditions by incorporating protective measures into the work routine. The heat stress prevention procedures below will be implemented whenever the temperature exceeds 75 degrees Fahrenheit for workers in normal work clothing, or 65 degrees Fahrenheit for workers in chemically protective clothing.

1.0 GENERAL REQUIREMENTS

Heat stress can be a significant field site hazard, especially for workers wearing chemically protective clothing (CPC). Site personnel must be instructed in the recognition of heat stress symptoms, the first-aid treatment procedures for severe heat stress, and the prevention of heat stress injuries. Workers must be encouraged to immediately report any heat stress that they may experience or observe in fellow workers. Supervisors must use such information to adjust the work-rest schedule to accommodate such problems.

Wherever possible, a designated break area should be established in an air conditioned space, or in shaded areas where air conditioning is impractical. The break area should be equipped to allow workers to loosen or remove protective clothing, and sufficient seating should be available for all personnel. During breaks, workers must be encouraged to drink plenty of water or other liquids, even if not thirsty, to replace lost fluids and to help cool off. Cool water should be available at all times in the break area, and in the work area itself unless hygiene/chemical exposure issues prevent it.

Workers who exhibit ANY signs of significant heat stress (e.g., profuse sweating, confusion and irritability, pale, clammy skin), should be relieved of all duties at once, made to rest in a cool location, and provided with large amounts of cool water. Anyone exhibiting symptoms of heat stroke (red, dry skin, or unconsciousness) must be taken immediately to the nearest medical facility, taking steps to cool the person during transportation (clothing removal, wet the skin, air conditioning, etc.). Severe heat stress (heat stroke) is a life threatening condition that must be treated by competent medical authority.

2.0 WORK-REST SCHEDULE

The prevention of heat stress is best performed through supervisor observation of employees and routine heat stress awareness training activities. However, it is also necessary to implement a work routine that incorporates adequate rest periods to allow workers to remove protective clothing, drink fluids (vital when extreme sweating is occurring), rest and recover. The frequency and length of work breaks must be determined by the work supervisor based upon the ambient temperature, amount of sunshine, the amount of physical labor being performed, the physical condition of the workers, and protective clothing being used.

2.1 ESTABLISHING THE WORK-REST SCHEDULE

Earth Tech permits the use of either of two techniques to initially determine an appropriate daily work-rest schedule. These methods are:

1. Wet Bulb Globe Thermometer (WBGT) Method – this method is preferred, if a WBGT meter is available.
2. Adjusted Temperature Method – this method should be used only if WBGT data is not available.

Either procedure will provide the work supervisor with a recommended routine, however adjustments to this routine may be required to accommodate the specific daily conditions at the work site.

2.1.1 WBGT Method

The WBGT is based on guidance prepared by the American Conference of Governmental Industrial Hygienists (ACGIH) and requires the use of a WBGT monitor to provide readings for use in Tables 1 and 2. Table 1, the *Non-CPC Activities WBGT Chart*, is intended for use where personnel are not utilizing CPC. Where workers are required to utilize CPC, Table 2, the *CPC Activities WBGT Chart*, will be used.

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WBGT readings (in degrees Fahrenheit - °F) are compared directly with the values the applicable WBGT Chart for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching, very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

Table 1. Non-CPC Activities WBGT Chart

Work-Rest Frequency	°F-WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	85	81	78	
75% Work – 25% Rest	86	83	81	
50% Work – 50% Rest	88	85	83	81
25% Work – 75% Rest	90	87	86	85

Modified from ACGIH's 2002 Threshold Limit Values for Chemical Substances and Physical Agents, for acclimatized workers

Table 2. CPC Activities WBGT Chart

Work-Rest Regimen	°F-WBGT			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
Continuous Work	74	70	67	
75% Work – 25% Rest	75	72	70	
50% Work – 50% Rest	77	74	72	70
25% Work – 75% Rest	79	76	75	74

Modified from ACGIH's 2002 Threshold Limit Values for Chemical Substances and Physical Agents for acclimatized workers

2.1.2 Adjusted Temperature Method

This method can be utilized where WBGT data is not available, and requires only that the ambient temperature (in degrees Fahrenheit - °F) be known. Adjustment factors are applied to the ambient temperature to account for departures from ideal conditions (sunny conditions, light winds, moderate humidity and a fully acclimated work force). The adjustments should be made by addition or subtraction to the ambient temperature reading, or changes in table position, as indicated in Table 3. Adjustments are independent and cumulative, all applicable adjustments should be applied. The result is the *Adjusted Temperature*, which can be compared with the values in Table 4 for the applicable work rate (where light work corresponds to minimal physical activity besides standing/watching, very heavy work corresponds to significant, continuous physical labor) to determine the work-rest frequency.

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Table 3. Temperature Adjustment Factors

Time of Day

Before daily temperature peak ¹	+2 °F
10 am – 2 pm (peak sunshine)	+2 °F

Sunshine

No clouds	+1 °F
Partly Cloudy (3/8 – 5/8 cloudcover)	-3 °F
Mostly Cloudy (5/8 – 7/8 cloudcover)	-5 °F
Cloudy (>7/8 cloudcover)	-7 °F
Indoor or nighttime work	-7 °F

Wind (ignore if indoors or wearing CPC)

Gusts greater than 5 miles per hour at least once per minute	-1 °F
Gusts greater than 10 miles per hour at least once per minute	-2 °F
Sustained greater than 5 miles per hour	-3 °F
Sustained greater than 10 miles per hour	-5 °F

Humidity (ignore if wearing CPC)

Relative Humidity greater than 90%	+5 °F
Relative humidity greater than 80%	+2 °F
Relative Humidity less than 50%	-4 °F

CPC

Modified Level D (coveralls, no respirator)	+5 °F
Level C (coveralls w/o hood, full-face respirator)	+8 °F
Level C (coveralls w/hood, full-face respirator)	+10 °F
Level B w/airline	+9 °F
Level B w/SCBA	+9 °F and right one column ²
Level A	+14 °F and right one column ²
Other	Specified in the HASP

Miscellaneous

Unacclimated work force	+5 °F
Partially acclimated work force	+2 °F
Working in shade	-3 °F
Breaks taken in air conditioned space	-3 °F

To read Table 4, determine the *Work Rate* at which the workers will be operating (where light work corresponds to minimal physical activity besides standing/watching, very heavy work corresponds to significant, continuous physical labor), then read down the column to the temperature range which corresponds to the *Adjusted Temperature*. The *Work-Rest Schedule* for that row indicates the appropriate work schedule

Shaded areas in Table 4 indicate high hazard conditions. When such conditions are anticipated during any work day the field supervisor **MUST** include a discussion of heat stress as part of the daily tailgate safety meeting topics

¹ This adjustment accounts for temperature rise during the day. If the temperature has already reached its daytime peak it can be ignored.

² Locate the proper column based on work rate then move one column to the right (next higher work rate) before locating the corresponding adjusted temperature

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Table 4. Work-Rest Schedule Based on Adjusted Temperature

Work-Rest Schedule	Adjusted Temperature (°F)			
	Light Work	Moderate Work	Heavy Work	Very Heavy Work
No specified requirements	< 80	< 75	< 70	< 65
15 minute break every 90 minutes of work	80 – 90	75 - 85	70 - 80	65 – 75
15 minute break every 60 minutes of work	>90 – 100	> 85 - 95	>80 - 85	>75 - 80
15 minute break every 45 minutes of work	>100 – 110	>95 - 100	>85 - 90	>80 - 85
15 minute break every 30 minutes of work	>110 - 115	>100 - 105	>90 - 95	>85 - 90
15 minute break every 15 minutes of work	>115 - 120	>105 - 110	>95 -100	>90 - 95
Stop Work	>120	>110	>100	>95

Note: Time spent performing decontamination or donning/doffing CPC should not be included in calculating work or break time lengths

2.2 EVALUATING THE WORK-REST SCHEDULE'S EFFECTIVENESS

Once a work-rest schedule is established, the work supervisor must continually evaluate its effectiveness through observation of workers for signs/symptoms of heart stress. Measurement of each worker's pulse can provide additional information in determining if the schedule is adequate, and is accomplished as follows:

At the start of the workday each worker's baseline pulse rate (in beats per minute – bpm) is determined by taking a pulse count for 15 seconds and multiplying the result by four. Worker pulse rates can then be measured at the beginning and end of each break period to determine if the rest period allows adequate cooling by applying the following criteria:

1. Each worker's maximum heart rate at the start of any break should be less than [180 minus workers age] bpm. If this value is exceeded for any worker, the duration of the following work period will be decreased by at least 10 minutes.
2. At the end of each work period all workers' heart rates must have returned to within +10% of the baseline pulse rate. If any worker's pulse rate exceeds this value the break period will be extended for at least 5 minutes, at the end of which pulse rates will be re-measured and the end-of-break criteria again applied.

REFERENCES: None

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SUMMARY: Decontamination of contaminated personnel and equipment will comply with the requirements specified below, as well as any additional site-specific procedures that may be required by the Health and Safety Plan (HASP)

1.0 DEFINITIONS

Contamination Reduction Zone (CRZ) - the transition area between the contaminated area and the clean area where decontamination activities occur

Decontamination – the process of removing or neutralizing contaminants that have accumulated on personnel or equipment

Exclusion Zone (EZ) – the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc

LOP – Level of Protection (Personal Protective Equipment or PPE)

Support Zone (SZ) - an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are located

2.0 GENERAL REQUIREMENTS

When possible, all necessary steps shall be taken to reduce or minimize contact with chemicals and impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment over, tracking, or splashing potential or known impacted materials)

All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the exclusion zone.

All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to entering the SZ.

Decontamination procedures may vary based on site conditions and nature of the contaminant. If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel must assess the potential exposures created by the decontamination chemical(s) or solutions. The MSDS must be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.

All contaminated personal protective equipment (PPE) and decontamination materials shall be stored and disposed of in accordance with site-specific requirements determined by site management.

3.0 DECONTAMINATION EQUIPMENT

The equipment required to perform decontamination may vary based on site-specific conditions and nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:

- Soft-bristle scrub brushes or long-handled brushes to remove contaminants;
- Hoses, buckets of water or garden sprayers for rinsing;
- Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions;
- Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
- Metal or plastic cans or drums for the temporary storage of contaminated liquids; and

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- Paper or cloth towels for drying protective clothing and equipment

4.0 PERSONAL DECONTAMINATION STEPS

Modified Level D

In the Exclusion Zone:

1. Equipment drop on plastic sheet
2. Remove the majority of gross contamination
3. Wash boot covers and outer gloves
4. Rinse boot covers and outer gloves
5. Remove tape
6. Remove boot covers and outer gloves

In the Contamination Reduction Zone (keep the most contaminated equipment near the EZ boundary):

1. Wash protective suits and safety boots
2. Rinse protective suits and safety boots
3. Safety boot removal
4. Remove protective suit
5. Wash inner gloves
6. Rinse inner gloves
7. Remove inner gloves
8. Remove inner clothing (if necessary)

In the Support Zone:

1. Finish with personal decon/hygiene wash procedures
2. Redress (if necessary)

Level C

In Exclusion Zone (near boundary of CRZ):

1. Equipment drop on plastic sheet
2. Remove the majority of gross contamination
3. Wash boot covers and outer gloves
4. Rinse boot covers and outer gloves
5. Remove tape
6. Remove boot covers and outer gloves

In the Contamination Reduction Zone (keep the most contaminated equipment near the EZ boundary):

1. Wash protective suits and safety boots
2. Rinse protective suits and safety boots
3. Change out (if required): Filter/mask change and redress (boot covers and outer gloves)
4. Safety boot removal
5. Remove protective suit
6. Wash inner gloves

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- 7 Rinse inner gloves
- 8 Remove respirator/mask
- 9 Remove inner gloves
- 10 Remove inner clothing (if necessary)

In the Support Zone:

- 1 Finish with personal decon/hygiene wash procedures
- 2 Redress (if necessary)

Level B

In the Exclusion Zone (near boundary of CRZ):

- 1 Equipment drop on plastic sheet
- 2 Remove the majority of gross contamination
- 3 Wash boot covers and outer gloves
- 4 Rinse boot covers and outer gloves
- 5 Remove tape
- 6 Remove boot covers and outer gloves

In the Contamination Reduction Zone (keep the most contaminated equipment near the EZ boundary):

- 1 Wash SCBA/airline equipment, protective suits and safety boots
- 2 Rinse SCBA/airline equipment, protective suits and safety boots
- 3 Change out (if required): Tank change and redress (boot covers and outer gloves)
- 4 Safety boot removal
- 5 SCBA backpack or airline equipment removal
- 6 Remove protective suit and/or splash suit
- 7 Wash inner gloves
- 8 Rinse inner gloves
- 9 Remove face piece/mask
- 10 Remove inner gloves
- 11 Remove inner clothing (if necessary)

In the Support Zone:

1. Finish with personal decon/hygiene wash procedures
- 2 Redress (if necessary)

Level A

In the Exclusion Zone (near boundary of CRZ):

1. Equipment drop on plastic sheet
2. Remove the majority of gross contamination
3. Wash boot covers and outer gloves (if applicable to ensemble)
4. Rinse boot covers and outer gloves (if applicable to ensemble)
5. Remove tape (if applicable to ensemble)
6. Remove boot covers and outer gloves (if applicable to ensemble)

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In the Contamination Reduction Zone (keep the most contaminated equipment near the EZ boundary):

1. Wash protective suite and safety boots
2. Rinse protective suits and safety boots
3. Change out (if required): Tank change and redress (boot covers and outer gloves)
4. Safety boot removal
5. Remove fully encapsulating suit and hard hat
6. Remove SCBA backpack
7. Wash inner gloves
8. Rinse inner gloves
9. Remove face piece/mask
10. Remove inner gloves
11. Remove inner clothing (if necessary)

In the Support Zone:

1. Finish with personal decon/hygiene wash procedures
2. Redress (if necessary)

5.0 EQUIPMENT DECONTAMINATION

All equipment leaving the EZ shall be considered contaminated and must be properly decontaminated to minimize the potential for exposure and off-site migration of impacted materials. Such equipment may include, but is not limited to: sampling tools, heavy equipment, vehicles, PPE (hoses, cylinders, etc.), and various handheld tools.

All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the LOP required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors. Following equipment decontamination, employees may be required to follow the proper personal decontamination procedures above.

For larger equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to ensure proper decontamination.

For smaller equipment, use the following steps for decontamination:

1. Remove majority of visible gross contamination in EZ
2. Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment.
3. Rinse equipment
4. Visually inspect for remaining contamination
5. Follow appropriate personal decontamination steps outlined above

All decontaminated equipment shall be visually inspected for contamination prior to leaving the CRZ. Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

REFERENCES: None